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Supreme Court of the United States

OCTOBER TERM, 1974

No. 74-1555

KAISER INDUSTRIES CORPORATION, *et al.*, *Petitioners*

v.

JONES & LAUGHLIN STEEL CORPORATION, *Respondent*

APPENDIX TO PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

VOLUME II—Pages 303-602

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JONES & LAUGHLIN STEEL CORPORATION, *Respondent*

Table of Contents of Appendix

Page

Volume I

Opinion Of The Court Below 1

Judgment Of The Court Below 42

Opinion Of The District Court 43

Opinion Summary—Collateral Estoppel 44

Opinion Compendium—Collateral Estoppel 155

Volume II

Opinion Of The District Court [continued] 303

Opinion—The Jones & Laughlin Cases 487

Judgment Of The District Court 594

Order Instructing Special Master 596

Volume III

Kaiser Industries Corp. v. *McLouth Steel Corp.* 603

Henry J. Kaiser Co. v. *McLouth Steel Corp.* 645

Suess *et al.* Patent No. 2,800,631 805

Specification and Claims of Suess Patent 813

Patent Office, who, after inquiry, found nothing wrong with the words "avoidance of deep penetration" except its negative character, and who, because of its aptness and differentiation from prior art, found greater appropriateness in the words "avoidance of material agitation." *Graham* v. *John Deere Co.*, 383 U.S. 1, 18 (1965); *Grimmell Corp.* v. *American Monorail Co.*, 285 F.Supp. 219, 223 (D.C.S.C., 1967). This would be true notwithstanding the fact that the courts have a superior right under the law to overrule the decisions of the patent office. *Hughes Tool Co.* v. *Williams*, 82 F.Supp. 408 (D.C. Okla., 1949) modified on other grounds, 186 F.2d 278 (C.A. 10, 1950).

It is regretable, I believe, that the LeRoy deposition had not been before the *McLouth* trial judge, since it might have clarified the difference between physical action induced by natural processes. It would also have differentiated the meanings of "agitation" as it appears in the claim and "agitation" as it is used in the specification, as well as the word "turbulence" as it is used on **[198]** the one occasion in the specification (Col. 6, line 69) when the patentees described the chemical exhaustion, "When the flame dies and carbon combustion is completed, the bath becomes relatively quiet and intimate contact between slag and metal bath ceases. The turbulence of the bath and slag due to the oxygen stream impinging from directly above is insufficient to cause continuance of oxygen-metal reactions." (Col. 6, lines 66-72).

The chemical action "turbulence" spoken of in the Opinion as being "agitation" is commented and ruled upon in the Opinion as follows:

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examiner of Division Three (Metallurigical Arts) on November 1953 and served there until November 1958. At the time he was deposed on January 8, 1970, he had retired from the top position which he had attained as Supervisor-Primary Examiner in the Patent Office. (J & L, PX 1002, pages 3-5).

> "This language is the sole reference in the specification of the patent to an *agitation of the bath by the jet.* In this reference, no mention is made of the depth of penetration. Certainly this reference does not expressly teach that only the avoidance of deep penetration results in the avoidance of material agitation of the bath by the oxygen stream. No causal relation between deep penetration and material agitation is taught." (Emphasis added) (257 F.Supp. at page 430).

It is obvious when looking at this reference, (Col. 6, lines 66-72) that the word "agitation" is not mentioned at all. It has nothing to do with deep penetration or even material agitation, but is simply an explanation of the fact that the "turbulence of the bath and slag due to the oxygen stream's impinging" ceases when the combustion has been completed. This was simply a verification that the oxygen jet physically contacts the metal in the bath causing ignition and visible flame within **[199]** the first minute of the blow, (Col. 4, lines 43-48), and when the chemical oxidation-reaction is completed, the physical action of the oxygen jet proves inconsequential.

Therefore, if this significance in the meaning of the word "agitation" in Claim 1 is being projected to the meaning of "turbulence," as just mentioned, it would very well be like mixing "kids," as children are sometimes called, with "kids," as relates to young goats. The word "turbulence as used by the patentees in this instance is somewhat, but not entirely, like the word "agitation" as used in describing the carbon FeO reaction forming carbon monoxide to cause "a strong boil or agitation of the bath, which auguments the bath circulation . . ." (Col. 4, lines 60-65). Since both the "turbulence" referred to in Col 6 and the "agitation" in Col. 4 are the results of chemical reaction, they are significantly similar, but dissimilar from the meaning of the word "agitation" in Claim 1, because its causative significance lies not in chemistry but in the mechanical functioning of the operator.

One of the rulings in the Opinion is that the ". . . plaintiffs have admitted that the specification does not expressly teach any such correlation" (avoidance of material agitation by the oxygen stream and avoidance of deep penetration). (257F.Supp. at page 430). I have followed through the examples presented in the Opinion and search the record for such admissions, but cannot arrive at a similar conclusion. **[200]** I am of the opinion that the *McLouth* District Court was searching for exact words. In a colloquy with the Court, the plaintiffs' counsel stated:

> ". . . where you avoid deep penetration you avoid this this material agitation of the bath by the oxygen stream."

The District Court replied:

> "Yes, that is what you say. That is true. But the specification *doesn't use that language* . . . It doesn't say that if you avoid deep penetration that material agitation would be avoided. *It doesn't say that in so many words."* (Emphasis added) (PX-J-39 p. 13,329) (257 F.Supp. at page 430).

Again we observe that the District Court was looking for exact words when it observed that the terms "material agitation" or "avoidance of material agitation" were not stated in the specification.

> "The use of that language? You don't find it anywhere . . . Even the term 'deep penetration' is not associated in language with the term 'material agitation' as such. I mean you don't find the words 'agitation' and 'material agitation' . . . in the specification." (PX-J-39 pp. 13,327-13,328).

The District Court then concluded that it did not fall within the rule of law that each and every term used in a patent claim is not required to be set forth in the specification, because he said,

[201] ". . . here you have a phrase which, as I understand it, is almost the gist of the patent, or, at least, one of the very important elements, the avoidance of material agitation. And certainly you would agree, I think, that that must be taught." (PX-J-39 p. 13,328).

This conclusion arises from the District Court's conclusion that avoidance of deep penetration is the "gist" of the invention. Undoubtedly if this conclusion were true, one would expect the exact language to appear in the claims.

The plaintiffs' contentions are based upon what they allege are misconceptions by the District Court, all of which led to an immediate finding that "the concept of material agitation of the bath by the oxygen stream is purely fictional, since plaintiffs' own testimony strongly suggests that material agitation by the jet could not be achieved even with deep penetration." (257 F.Supp. at 432). The plaintiffs contend that there was no such testimony on the part of the plaintiffs' witnesses which could or should have persuaded the *McLouth* District Court into this thinking.

While it would seem that the *McLouth* District Court relied considerably upon what the experts might not have been able to find in "so many words" in the specification, it is incumbent upon me to rely less upon what the experts might or might not **[202]** have found in the specification, but rather what I, as the trial judge here may find.

I have particularly searched the record for the supports in the District Court Opinion that the "plaintiffs have admitted that the specification does not expressly teach any such correlation" (avoidance of material agitation by the oxygen stream and avoidance of deep penetration). (257 F.Supp. at page 430). I have followed through with the examples cited in the Opinion. The first is:

> "[Counsel For Plaintiffs]: • • • And then we have the teaching in regard to the avoidance of deep penetration.
>
> • • •

> "And, of course, where you avoid deep penetration you avoid this material agitation of the bath by the oxygen stream.
>
> "The Court: Yes, That is what you say. That is true. But the specification doesn't use that language.
>
> "[Counsel For Plaintiffs]: That is correct.
>
> "The Court: It doesn't say that if you avoid deep penetration that material agitation would be avoided. It doesn't say that in so many words.
>
> "[Counsel For Plaintiffs]: That is correct, your Honor." (257 F.Supp. at page 430).

However, if the District Court had followed through with the recording of the colloquy, it would have been apparent that counsel for the plaintiffs was attempting to distinguish the "agitation" caused by the jet from the prior art. The colloquy **[203]** continued (PX-J-39, pp 13,329-13,330, 13,332-13,333).

> "Mr. William Webb: That is correct, your Honor. But I think you must remember also that the prior art teaching is to *agitate* the bath by deeply penetrating into the bath . . .
>
> The Court: Would deep penetration necessarily cause material agitation, excessive agitation? Does that necessarily follow?
>
> Mr. William Webb: I believe so. I think that that is the effect of it.
>
> The Court: Does the testimony show that now? . . .
>
> Mr. William Webb: Yes, your Honor. I am sure that both— . . .
>
> The Court: Then if there is in fact the deep penetration, like under Schwarz and Miles, or, as you claim, under Durrer and Hellbruegge—if there is in fact deep penetration, does the *agitation of the bath caused by deep penetration overcome the circulation caused by the chemical reactions?* . . .

> MR. WILLIAM WEBB: . . . I don't believe its covered by the evidence.
>
> But I am sure of one thing, and that is that the patents themselves which give this teaching of deep penetration expressly point out that what they are doing and what they are seeking to accomplish is the *stirring of the bath by the oxygen stream.* The Miles patent makes that very clear. So that is what the object was of penetrating the gas deeply into the bath." (Emphasis added)

Here we see the construction by which the District Court gave the words "agitation" and "circulation" identity of meaning, and then juxtaposed them interchangeably as actions in a bath caused by deep penetration and as circulation or action in a bath caused by chemical reaction. And so it found it difficult to understand how these two identical actions could be **[204]** in conflict with each other, whether caused by deep penetration or chemical reaction.

The plaintiffs' counsel was attempting to explain the significance in the physical sense as it differentiates the use of the word "agitation" in the Suess claim from the physical, positive action which is described in prior art and thus consistently within the meaning of "avoidance of material agitation." This furthered the obligation of the applicants to differentiate their teaching from the prior art method of deep penetration. Under Section 112 this was a required showing between the instant application for a patent and the prior art. *Flexwood Co.* v. *Saussner & Co.*, 145 F.2d 528, C.A. 7, 1944.

A second example cites Dr. Elliott's testimony. The District Court said, "According to Dr. Elliott's testimony (R. 6638-6642), the specification of the patent in suit teaches the correlation between the avoidance of deep penetration and the avoidance of material agitation at six different places."[34] The Opinion refers to these separately

[34] This testimony appears at PX-J-20, pp. 6638-6642.

and makes a conclusion that "Agitation of the bath by the jet is not mentioned" in one way or another, but that in any event "none of the references relied on by the plaintiffs teach any causal relation between deep penetration and material agitation by the oxygen stream." (257 F.Supp. at pages 430-431). References to which **[205]** the Opinion alludes are col. 3, lines 37-50; col. 4, lines 26-38; col. 6, lines 69-73; col. 4, lines 54-67; col. 9, lines 6-14; and col. 10, example No. 1.

My study of Dr. Elliott's testimony in this connection, both direct and cross, does not disclose any specific place where he took these six references and analyzed them. Rather, he accepted the instructions contained in the specification, particularly of blowing vertically and centrally, so as to avoid material agitation (PX-J-19 p. 6166). He said that the operator knows when he is avoiding material agitation when he (1) controls the slag; (2) does not unduly damage the refractories, and (3) has proper control of the bath composition (PX-J-19 p. 6167). He cited the same three factors in regard to avoidance of deep penetration (PX-J-19 p. 6169). We see that using the references given in the pages under study, with the exception of col. 6, lines 63-73, Dr. Elliott rather emphasized the local reaction zone, directly or indirectly, through example, and so in effect taught the importance of vertical and central placement. Defense counsel's cross examination of Dr. Eliott dealt most heavily with this phase rather than a direct correlation of "avoidance of deep penetration" to "avoidance of material agitation" (PX-J-20 p. 6410).

The sixth reference dealt with the quieting of the bath at the end of the decarbonization, when the reference said "the turbulence of the bath and slag due to the oxygen stream **[206]** impinging from directly above is insufficient to cause continuance of oxygen-metal reactions." Presumably this is done to show that there can be no material agitation by the oxygen jet when and where oxidation reaction processes are not active.

In all of this Dr. Elliott was explaining a relation to the instructions contained in the specification of how and when the oxygen jet can be used with unwanted physical agitation, and how and when such unwanted physical agitation by the oxygen jet would occur under certain circumstances. At one place he said (PX-J-20 p. 6633):

> "A. Well, I look at the statement in the patent with regard to lance arrangement. I analyze in my own mind the way that jets behave. And this combination of information brings out the fact that this is the way you get the least possible action of the jet."

Then again he said (PX-J-20 p. 6637):

> ". . . I believe that one skilled in the art, reading the patent, would call on those things which I discussed earlier with regard to refractory life, control of the localized reaction zone specifically. This is quite specific in the examples in the patent and in the specific statements of the patent with regard to phosphorus control, and this would convey a very clear picture of the problems arising when there was deep penetration."

He also said (PX-J-20 p. 6638):

> "When one is seeking to agitate the bath by mechanical action of the jet, he must engage the bath with the gas stream. This can be done only as the gas stream enters deeply into the bath if one wants to do it effectively. Hence there is a direct relationship between these two terms deep penetration and material agitation."

[207] Dr. Elliott substantially repeated the same testimony here. (See CE p. 252).

One reason the District Court asserted for its insistence on specific language was that with the language presented ". . . persons skilled in the art of steelmaking reading the patent are not informed of the meaning of the language in the claim referring to the avoidance of material agitation by the oxygen stream." (257 F.Supp. at page 431). This holding, however, is in conflict with the District Court's

holdings that with the admissions of the defendant's employees,

> "In sum, this Court finds that the specification of the patent in suit, despite certain indefiniteness and inaccuracies, nevertheless complies with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and use the same.' " (257 F.Supp. at page 424).

Additionally, the difficulty with this excerpt (257 F.Supp. at page 431) is that considering the first two sentences if "the concept of the avoidance of material agitation of the bath by the jet would not have been meaningful to persons skilled in the art at the time the invention was made," or if Schwarz and Miles patents did not mention the concept of material agitation, and if either Miles or Schwarz patents had taught any causal relation between deep penetration and material agitation, they would have anticipated the Suess patent and it would have been obvious and nonpatentable.

But the District Court held, "In other words the Court finds that the patent in suit is not anticipated by **[208]** the prior art." (257 F.Supp. at page 395). And further, such material agitation "would certainly not have been obvious to steelmakers in 1950 . . ." (257 F.Supp. at page 404) Likewise, Dr. Chipman on cross-examination by counsel for the defendant (commencing with PX-J-4 p. 888A) was asked about the physical force of the jet being limited in order that the agitation of the bath not become material. He replied (PX-J-4 p. 889) that the word "material" had to be used in context. He explained that there were other sources of agitation than the deep penetration. However, when the questioning was resumed on the point, he elaborated on his statement and said (PX-J-4 p. 1066):

> "If you wanted to encourage agitation of the bath by the oxygen stream . . . you would not blow vertically downward in the center of the bath. You would blow

at an angle and somewhat off center, and this would give your bath the material agitation."

Dr. Chipman perhaps presented a clearer picture of physical agitation (PX-J-4 pp. 889-900A), all of which was concisely summarized in the plaintiffs' main brief at McLouth (PX-K-1 p. 192) in the following words:

> ". . . that the agitation by the oxygen stream becomes material and, hence, objectionable when it *interferes* with the bath motion caused by chemical reactions, or when it causes significant refractory damage, or when it *interferes* with the **[209]** proper formation and composition of the slag as a result of the deep penetration required to create the agitation." (Emphasis added)

Dr. Chipman summarized the "how to do it" by replying (PX-J-4 p. 1064) that by following the specific teachings of the patent . . . as regards lance height, size of heat, pressure, flow rate, nozzle to bath distance" anyone skilled in the art would not have any difficulty in blowing in such a way as to avoid material agitation of the bath. He said (PX-J-4 p. 1067) that if you followed the specific teachings of the patent you would avoid material agitation of the bath by the oxygen stream. Nevertheless, the *McLouth* District Court held

> "Thus this Court concludes that the claim step of avoidance of material agitation of the bath by the oxygen stream is not supported by the specification of the patent in suit except in a very limited and perhaps meaningless way, and could not have been a meaningful concept to persons skilled in the art at the time the invention was made, especially since the concept did not appear very meaningful to some of plaintiffs' expert witnesses even at the trial roughly fourteen years later.
>
> This Court is further persuaded on the basis of plaintiffs' own testimony that the concept of material agitation of the bath by the oxygen stream is purely fictional . . ." (257 F.Supp. at page 432)

Here, again, we are reminded that the Opinion contained several rulings to the effect that persons skilled in the art **[210]** of steelmaking could use, make and perform the Suess et al. process in accordance with the instructions as were given in the patent.

The conclusion that "avoidance of material agitation" "could not have been a meaningful concept to persons skilled in the art at the time the invention was made," is contradicted in the Opinion itself:

> First, "In sum, this Court finds that the specification of the patent in suit, despite certain indefiniteness and inaccuracies, nevertheless complies with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and use the same.'" (257 F.Supp. at page 424)
>
> And second, "The substantial advantages of the Linz oxygen blowing process of steelmaking quickly became apparent . . .
>
> The reaction of steelmakers to the Linz process was one of initial skepticism followed by recognition of the invention and adoption of the process. The remarkable success of the Linz process is dramatically illustrated by the fact that no open hearth furnace has been built in this country since 1943, when knowledge of the Linz process became available in this country." (257 F.Supp. at pages 398-399)

And yet the Opinion does not find complete absence of causal connection between "the avoidance of deep penetration **[211]** and the existence of the features of the patent claims, including a localized reaction zone, the avoidance of material agitation of the bath and a circulation caused by chemical reactions." (257 F.Supp. at page 403)

The Court conceded that, "it is true that the Rinesch and Hauttmann affidavits in 1957 attributed a causal con-

nec'ion." However, the District Court disregarded these for the reason that ". . . it is a serious question whether persons skilled in the art of steelmaking in 1950 would have understood the features of the claims of the patent in suit as depending upon avoidance of deep penetration for their existence. In other words, it is questionable whether the claims of the patent in suit have any clear connection with what appears to this Court to be the actual invention by the patentees." (257 F.Supp. at page 403)

Thus, if it is true that what appeared to the District Court to be the actual invention by the patentees was "avoidance of deep penetration" as "the gist of the invention" it might very well have been necessary that more emphatic words than "to such an extent as to avoid material agitation of the bath by the oxygen stream" appear in the claims. For the failure by the applicants to have provided more suitable words, **[212]** the patent efforts of the applicants might indeed be subject to failure. However, if the testimony of the witnesses at the first post-trial hearing before me on the file wrapper estoppel issue is entitled to any weight and credibility, then the patentees provided suitable words to describe their advance.

[213] **XI. 3000-8000 to 1**

The McLouth District Court Opinion states that,

> "This Court is further persuaded on the basis of plaintiffs' own testimony that the concept of material agitation of the bath by the oxygen stream is purely fictional, since plaintiffs' own testimony strongly suggests that material agitation by the jet could not be achieved even with deep penetration." (257 F.Supp. at page 432)

This conclusion is to a large extent based on the testimony of Dr. Ascher H. Shapiro, a professor of Mechanical Engineering at Massachusetts Institute of Technology and a plaintiffs' witness. Dr. Shapiro testified that the force of

chemical reactions in the bath would be "roughly 3,000 times stronger than the force of the jet blowing vertically from above . . ." (257 F.Supp. at page 432, R. 3772-3773). The Court then concluded "In view of the tremendous force of chemical reactions agitating the bath and initiating a circulation downward in the center of the bath as compared with the relatively feeble agitating power of the jet, it seems impossible that a deep penetration by the jet could overcome or even materially affect such circulation, so as to cause a material agitation by the oxygen stream." (257 F.Supp. at page 432).

The Court thereafter referred to certain testimony of Dr. Elliott indicating that the physical force of the jet was indeed very small, in comparison to the overwhelming force of the oxygen action. Therefore, the *McLouth* District Court **[214]** wanted to know how there could be any "material agitation of the bath by the oxygen stream" which could possibly interfere with a force that was 3,000 times stronger than the physical force of the jet.

From my full inquiry and study of the record of the case, the answer to the question thus posed becomes apparent.

The District Court extracted this question from the testimony of Dr. Shapiro, who was a specialist in the field of thermodynamics, fluid dynamics and power production. He presented evidence for the purpose of proving what caused the circulation in the bath. This part of the transcript of testimony comprised 2,293 pages with a myriad number of demonstrations, movies, charts and diagrams, as well as calculations with explanations of the cause and effect of mechanical and chemical reactions and interactions.

From his many demonstrations and from his own expertise, Dr. Shapiro concluded that circulation in the molten bath was the end result caused by the particular dynamics of the bath, whether fluid, chemical or kinetic. I have carefully examined and questioned the evidence which

he presented and have endeavored to relate it to the context of the Suess et al. specification. So far as his testimony was concerned as it related to the units of force on the molten surface of the bath, the end result of his testimony was that

[215] "... the force with which the mechanical action of the jet is capable of applying to a melt of some 200,000 pounds of weight, is only about 6.6 or six and a half pounds." (PX-J-12, p. 3740)

He said that the 6½ pounds is the total frictional force applied tangentially to the surface, and that the downward force was in the neighborhood of 350 pounds which could only produce an indent, and could not produce motion in the bath. Therefore there could be no circulation produced by the physical force of the jet inside the bath, and this was the purpose of his testimony.

In explaining what did cause the circulation in the bath, he arrived at two parallel calculations, one of force and one of power. By a series of calculations he demonstrated that the force resulting from the chemical action which provides circulation in the bath, is over 3,000 times as great as the frictional force available from the jet itself (PX-J-12, p. 3756-3773). However, as relates to power, he demonstrated how the calculation should be made, and concluded that the power applied to the circulation of the bath *from chemical origin* is 8,200 times as large as the power applied to the bath by mechanical action of the jet (PX-J-12, p. 3774-3801). He made no mention whatsoever of any relationship between the causes of the circulation and any potential application of the jet as an agitation of the bath. This evidence opposed that of the McLouth experts who attempted to show that the **[216]** circulation was physically produced by the jet only, and that it was upward in the center, because so induced by the physical action of the jet.

From this part of the examination of Dr. Shapiro's testimony it is obvious that its content relates to the proportionate force or power which creates the circulation in the molten bath in accordance with the belief of the Suess patentees. The ultimate conclusion presented is that only chemical action can produce such circulation in the bath and so supports the references in the patent specification. Stated differently, the evidence of Dr. Shapiro was submitted for the purpose of showing that the oxygen jet had no physical potential for producing circulation in the bath, despite McLouth's attempt through its experts to show that the circulation, if any, was produced by the jet action only and that it was upward in the center because it was mechanically produced.

With this limited understanding of the substance of Dr. Shapiro's testimony, we now look at the specification, particularly, col. 4, lines 43-60, which describes the change taking place when the oxygen combines with the iron and forms the oxides. Oxygen in combination with other elements has already begun its chemical combination-oxidation-reaction function. Its physical force in the jet no longer prevails. Its chemistry generating power does. We saw this proved in the **[217]** ladle-rudder exhibitions at Linz, Austria (PX-36C, 36-D, PX-161, PX-185A) when the oxygen was turned on and off. As it was applied the oxidation-combination-conversion started; when the oxygen was turned off, it stopped. When turned on again, the oxidation-combination-conversion action resumed.

Thus, we see two forces in their respective realms in a "before-and-after" marriage symbol by which both become atomically united. Comparably we see the ordinary household match, innocuous, as it lays quietly undisturbed, but when friction is applied (heat applied) in the presence of oxygen, it bursts into flame. But the oxygen which is consumed from the air is an infinitessimal quantity compared to the flame to whose generation it gave itself. So it is in the molten metal bath, when the oxygen impinges on

the molten metal bath, most of the oxygen in the jet becomes chemically converted and itself is consumed.

The answer then to the 3000-8000 to 1 question raised in the Opinion is that the 3000-8000 units of force are altogether the chemical reaction of oxidation-combination reaction which are engendered, propagated and produced by the one unit of oxygen force, whereupon it combines or dissolves, or in any event disappears into, and becomes a part of the resulting chemical reactions. Thus it is quite obvious that one unit of force or power of the oxygen jet does not overcome or conflict with the 3000-8000 unit of chemical force or power of which it naturally is a part and for which together they have become a synchronism.

[218] **XII. Agitation v. Agitation**

If the scientific answer to the question of how a 1 unit of force-power could overcome a 3000-8000 unit of force-power, is that it cannot and does not, but that rather they become combined or integrated, then the next question is why did that problem confront the District Court? I am convinced that this occurred because a great deal of confusion surrounded the word "agitation."

The term "to agitate" means[34] (1) to move with a violent or irregular action, to set or keep in motion; (2) to stir up or excite; to perturb. The word "agitation" means either the act of agitating or the state of being agitated. Thus this word may have either an active or passive significance. As already stated, the word "agitation" appears only twice in the patent: once in the specification where it is used as a result of a chemical reaction which in turn becomes the chemical causative factor of another chemical reaction; and once where it is used in the claim in its physically resultant significance.

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[34] Webster's Third New International Dictionary, 1971 at page 42.

A number of statements in the Opinion inject a conflict of thinking between the physical oxygen jet itself, and the chemical **[219]** reactions which the oxygen jet generates. Certain references in the Opinion relate the word "agitation" in the Claim in the same way as does the prior art of producing chemical turbulence by injecting the oxygen jet within the interior of the bath. Thus, a conflict is formalized between the significance of the "avoidance of material agitation" and "avoidance of deep penetration."

In a large measure I am convinced that much of this misunderstanding of the significance of the word "agitation" occurred because the plaintiffs' experts failed to adequately explain both the factual and scientific factors involved. As one instance, we see in considerable parts of the *McLouth* transcript, that invariably the plaintiffs' expert witnesses and even sometimes counsel for the plaintiffs, loosely used the word "agitation" in such a way as it was not used in the patent, or failed at times to make it clear.

In other words, it was used interchangeably and indiscriminately in pointing out physical causation as signified in the words of Claim 1 and of resultant action, "motion" or "circulation" as signifying "turbulence" produced in the molten bath by whatever causes. When we realize how haphazardly even the **[220]** experts were in referring to these various terms, and especially to the word "agitation," and when we begin to read and re-read first of all the specification and then the testimony of the witnesses, we begin to understand that this could have been the cause of much confusion in the handling of the ideas which the patentees intended to convey to experts in steelmaking.

Observing with what interchangeability the words were used, we recognize, as we view the specification, with what exclusivity the patentees chose certain words or phrases such as "impinge," "surface," "reaction," "high temperature" and similar other words; that they used the word

"agitation" in the claim once and in the specification only once; that they did not use the word "turbulence" in the claim and used it only once in the specification; however, that the word "circulation" was employed on a number of occasions.

It will be observed that each word or phrase characterizes its own setting, and when all are pictured as a whole, the steelmaker or one expert in the art of steelmaking is given a panoramic understanding of what prior art was, what the objects of the patentees are, what the process is, what instructions enable any person skilled in the art to make and use the same, examples on **[221]** how it is to be done and finally, the scope of the invention and the claim of what the subject matter is which the applicants regard as their invention.

In the context in which the word is used in the claim, it is significant that it is used in a negative or cautionary sense of not actuating, provoking, stirring or prodding into action. Thus by the words which surround it in the claim, the word "agitation" relates to limiting or preventive activation or stirring of the bath by the oxygen stream. The meaning becomes quite obvious if we hypothetically and experimentally substitute the word "stirring" for the word "agitation" in the claim. It is not my prerogative to prescribe what words the patentees should have used because they are their own lexicographers. *Application of Rohrbacker,* 284 F.2d 531, C.A.P.A. 1960. However, it must be for me at this time to reasonably interpret these words. *Canaan Products Co. Inc.* v. *Edward Don & Co.,* 388 F.2d 540, C.A. 7, 1968.

Although the District Court asserted that the word "agitation" was added to the claim in the Patent Office as "an obvious attempt to distinguish the Miles patent" (257 F.Supp. at pages 431, 435), no blame may be attached to the patentees for so doing, **[222]** since the law requires it. In determining the validity of a patent, the scope and content of prior art must be examined, differences, if any, between the prior art and the claims at issue ascertained and a resolution made of the level of ordinary skill in the pertinent art. *Eagle Iron Works* v. *McLanahan Corp.,* 429 F.2d 1375, C.A. 3, 1970; *Rains* v. *Cascade Industries, Inc.,* 402 F.2d 241, C.A. 3, 1968; *Gould-National Batteries, Inc.* v. *Gulton Industries, Inc.,* 361 F.2d 912, C.A. 3, 1966.

The looseness with which the word "agitation" was used by counsel was noticeable when Dr. Hauttmann was speaking through an interpreter, and this very problem arose. The Court said (PX-J-8 p. 2410):

> "Better repeat that so that he will understand.
>
> "Dr. Alle [the interpreter]: I think we have a distinction here between 'movement' and 'agitation,' and both words have the same meaning in German, and that is the difficulty."

The defendant's witnesses used it indiscriminately during the trial of the case, and an example of such use was the statement by the defendant's superintendent, Lindberg, relating to the first ten minutes or so of a blow, as follows (PX-J-12 p. 3567-3568):

[223] "A. The reaction or agitation is very, very severe at that time."

The District Court made a reference where it, collaterally and unintentionally showed that Dr. Chipman used the word "agitation" loosely. As for instance, it quoted Dr. Chipman as follows:

> "The teaching that I find in the patent with respect to agitation leads me to conclude and understand that the *agitation* which is present in actuality is far greater than the agitation by the oxygen stream, compared to which the agitation of the oxygen stream becomes immaterial." (PX-J-4 p. 880) (257 F. Supp. at page 433). (Emphasis added).

Here we see the word "agitation" as the chemical action or turbulence as against the *agitation* as the result of the oxygen stream.[35]

Dr. Chipman also verified what the defendant's witness Lindberg said about the chemical action at the place of impingement when he was asked why they should bother with material agitation. He replied (PX-J-4 p. 900):

> "A. Because there is a great deal of *chemical agitation* produced." (Emphasis added).

Dr. Chipman was asked on another occasion that (PX-J-4 p. 1067):

[224] "Q. . . . if you followed the specific teachings of the patent, would you avoid material agitation of the bath by the oxygen stream?

A. Yes, I think you would."

because then such agitation caused by the jet would be insufficient to advantageously affect or change the *"agitation"* or *"movement"* of the bath by the *chemical reactions.*

Dr. Shapiro in speaking of the high temperature zone said (PX-J-12 p. 3845):

> ". . . there is a tremendous degree of agitation in this neighborhood *brought about by the chemical* reactions." (Emphasis added).

Also, when he explained the rudder demonstration conducted in June, 1963 at Linz, Austria, he described the variabilities of the rudders by the word "flutter" and said (PX-J-12 p. 3858-A):

[35] Incidentally, this statement by Dr. Chipman reveals that the oxygen stream agitation "becomes immaterial" as I point out in No. XI "3000-8000 to 1," where the one unit of oxygen stream force-power becomes absorbed and integrated into the 3000-8000 units of force-power which it creates by its chemical reaction-combination.

> ". . . That flutter, I believe, is due to the general turbulence and agitation which exists in the bath."

And at (PX-J-12 p. 3859):

> "It is due to the kind of *turbulence* and *agitation* which one could see in the oxy-acetylene explosion demonstration." (Emphasis added).

Even Dr. Elliott was careless about the precision with which he used the word "agitation" and confused it with "action" when he was asked about the chemical reactions occurring in the hot spot or the localized reaction zone (PX-J-19 p. 6275), and he said (PX-J-19 p. 6276):

[225] "They [chemical reactions] occur extremely rapidly. . . . There is considerable *agitation* action, when this occurs." (Emphasis added).

He later said that (PX-J-19 p. 6278):

> ". . . when the end point arrives and the chemical action diminishes greatly, the *agitation,* the *action* in the system diminishes greatly as well." (Emphasis added).

The District Court on a number of occasions used the word "agitation" interchangeably with action, circulation or turbulence in the bath, but it was most significantly used in the Opinion when Ann Arbor Demonstration No. 7 was being discussed.[36] I need cite only one or two references to make the point. As for instance, the Opinion speaks of ". . . the tremendous force of chemical reactions 'agitating' the bath . . .", and a comparison was made "with the relatively feeble agitating power of the jet . . ." (257 F. Supp. at page 432). Second, and more noticeably, interchange of the word "agitation" was used in the Opinion in connection with the discussion of Demonstration No. 7 at Ann Arbor, Michigan, which was cited in the Opinion

[36] These demonstrations are discussed under XIII.

for the purpose of showing that deep penetration did not produce "material agitation"—although I discuss this elsewhere [37] and refer to the fact that these demonstrations were not offered **[226]** by the defendant as any proof relating to "material agitation".

The conclusion made in the Opinion was: "In effect, the specification of the patent in suit presented a new theory of *agitation caused by chemical reactions,* and the claims referred to an avoidance of agitation by the jet to give the impression of an entirely new steelmaking process." (Emphasis added). (257 F. Supp. at page 435). Had the District Court used the word "circulation" instead of the word "agitation" at the first place as caused by chemical reactions, it would have been correct since the foundation upon which the Suess concept rests is in the procurement of chemical circulation as against the elimination of physical jet agitation. Thus the District Court used the word "agitation" as a substitute for the word "circulation" and it then used the word "agitation" in the second place by the jet as "an entirely new steelmaking process". If it had here used the word "stirring" by the jet, it would have again been correct as signifying the meaning of the word "agitation" in the claim. Therefore, it would seem that the Opinion misapprehended and interchanged the thought contained in the specification with that part of the claim which used the word "agitation" and related it to chemical reactions when the only thinking that the specification and claim indicated was that it is a physical function for the operator, a chemical **[227]** reaction thereafter, and an appropriate reference to the subject matter in Claim 1 of discharging the stream of oxygen within the limits defined in Claim 2 and in the specification.

This same thinking prevailed in the Opinion when it spoke of agitation of the bath relating to Demonstration

[37] These demonstrations are discussed under XIII.

No. 7, ". . . large amounts of slag and metal were thrown up and out of the converter onto the floor, indicating a violent agitation of the metal bath." (257 F.Supp. at page 433). Also, the term "throw-out" was used interchangeably with the word "agitation" as follows: "In other words, the 'agitation' of the bath as shown by the throw-out subsided . . ." (Emphasis added). (257 F. Supp. at page 434).

It is made more significant by the following excerpt:

> "If the bath *agitation* causing such *throw-out* of metal and slag had been caused by the mechanical action of the oxygen stream alone, the *throw-out* would not have ceased as it did near the end of the blow. It is obvious, therefore, that the *action* of the oxygen stream alone was not responsible for the *agitation* of the bath causing *throw-out* of metal and slag during the major part of the blow." (257 F. Supp. at page 434). (Emphasis added).

I have indicated elsewhere [38] that because the activity within the bath during the functioning of the process could not be visibly distinguished or sensed from the "stirring" function by the operator, there was confusion as to **[228]** both and a misconception of their differences.

If then there is no conflict between the 1 unit of physical force or power and the 3000-8000 units of physical force or power, why then were the words "to such an extent as to avoid material agitation" put in the claim by the applicants? All of that was explained by primary examiner LeRoy and Byron T. Gardner, Attorney in charge of the prosecution of the patent who testified at the first post-trial hearing as to what occurred in the Patent Office on May 1, 1957. LeRoy thought

> "that the language should try to bring out that the oxygen stream was confined or localized in the area

[38] Compendium VI.

somewhere near the surface of the bath." (PX-1002 p. 8).

The deep penetration he thought was well known in the art, but if you wanted to define a special penetration into the bath, he suggested that they use something to show it was localized in that area (PX-1002 p. 8):

> "It was well understood in the art that deep penetration meant a considerable distance into the bath and they wanted to avoid that concept . . . so the language that [they] finally adopted there was to bring out that feature." (PX-1002 p. 9, 10).

The primary examiner believed "that the definition in the language finally adopted adequately describe[d] the essential distinction over the art of record." (PX-1002 p. 12). He **[229]** also looked at "All of the art of record." (PX-1002 p. 20).

Mr. Gardner pointed out (FWE, p. 17-18) that a physical distribution of the oxygen throughout the molten metal as in the case of Miles was supposed to produce great physical turbulence and a very complete reaction and purification of the bath. As a practical matter it didn't work that way. The "mixing" or "agitation" of the bath by the oxygen stream developed very high temperatures throughout the bath with bad results. Suess applicants wanted to avoid this, and pointed out that their process "created a localized area of intense heat and reaction between the oxygen and carbon, silicon and other heat producing materials . . ." Thus Miles' mixing or agitation was to be avoided or prevented by Suess in order to provide for a localized reaction zone where chemistry would take over. Thus it seems that the word "agitation" in the claim as considered by the Patent Office and by the patentees as of the time of the processing of the patent was recognized in the sense of a limited or localized action by the jet. The reasons for this were obvious. If penetration

was too superficial slopping occurred. (PX-J-21 p. 7120-21), (PX-J-26 p. 8781). If penetration was too deep, it would interfere with the chemistry defined by Suess. If it was angular, or off-center, it would provide (whether **[230]** deeply blown or not) the stirring action indulged in by the prior art. (PX-J-3, p. 594-597, PX-J-4, p. 882, 1066, PX-J-19 p. 6165-66). Dr. Rinesch in the affidavit filed with the continuation-in-part application (PX-2A p. 83) said that deep penetration:

> ". . . creates an uncontrollable turbulence in the bath. The oxygen remains dissolved in the bath and the high oxygen content in the final steel leads to hot shortness or requires unsatisfactory quantities of deoxidizers. Furthermore, the phosphorus cannot be slagged off. Moreover, the walls, and particularly the bottom of the vessel become as hot as the reaction center and, therefore, are eroded severely."

Dr. Hauttmann in his affidavit filed with the continuation-in-part application (PX-2A pp. 90-91) said:

> ". . . that an essential characteristic of our method is that a limited center of reaction is created in the bath by blowing oxygen onto the surface through a nozzle which is placed at a considerable vertical distance from said surface, said center of reaction being spaced laterally from the side walls and vertically above the bottom wall substantially in the surface layer and *that agitation such as is caused by the deep penetration of the jet according to the methods of the prior art,* together with injury to the lining, and interference with the refining action thereby are avoided . . ." (Emphasis added).

He also said (PX-2A p. 91):

> "Another difference between the method discovered by us and the prior method is that the force of the oxyger jet vertically impinging on the bath surface is controlled to avoid uncontrolled *agitation or stirring* of the bath . . ." (Emphasis **[231]** added).

He said (PX-2A p. 92):

> ". . . our concept of securing purification of the entire contents of the bath mainly by the controlled circulation induced by the reaction center is just the opposite of trying to carry the oxygen to all parts of the bath by *agitation* produced by deep penetration, as by the methods disclosed in the Schwarz and Miles patents . . ." (Emphasis added).

Coinciding with the unwillingness of the District Court to accept "material agitation" in its physical sense as being differentiated from the prior art, it was unwilling to accept Dr. Elliott's statement that deep penetration agitated the bath, because it said that ". . . the meaning of material agitation would still not be adequately clarified, since even the concept of deep penetration does not acquire a clear or consistent meaning from Dr. Elliott's testimony." (257 F.Supp. at page 435). The Court then went on to say that because Dr. Elliott said that deep penetration both causes an up in the center circulation "which may cause refractory wear on the walls near the bath surface" and also "causes bottom damage to the refractory (R. 6166) as the result of a downward moving stream of hot metal in the center of the bath", that in effect Dr. Elliott's testimony was incredible because, "Clearly, circulation cannot be both up and down in the center at the same time." (257 F. Supp. at page **[232]** 435)

Since I have inquired into the scientific facts there involved, I discuss it more detailedly at the chapter entitled *Up And Down At The Same Time,* and accordingly assert that the cited basis for a lack of credibility of Dr. Elliott is unwarranted.

Thus, taken from the wording of the specification and from the evidence of record at *McLouth,* as well as the Patent Office witnesses of record here in the first post-trial hearing, the word "agitation" as contained in the claim is not fictional, but does have substantial significance to

the person skilled in the art of steelmaking to abide by the instructions contained in the specification and not to employ the oxygen jet physically as was the custom in the prior art. The fact that the applicants put the words "to such an extent as to avoid material agitation by the oxygen stream" to distinguish the Suess et al. patent from the prior art and to caution the persons expert in the art of steelmaking against doing what the prior art did physically, was a logical and valid act, and such terminology should not be negated.

[233] XIII. Defendant's Ann Arbor Demonstrations

In its Opinion, the District Court discredited Dr. Elliott's testimony and held there is, moreover, "tangible evidence in the record tending to confirm that the concept of material agitation by the oxygen stream is a fiction" (257 F.Supp. at page 433).

This conclusion was based upon the results of three in a series of five tests conducted by the defendants' experts at Ann Arbor, Michigan.

The Ann Arbor demonstrations were conducted on May 15, 19 and 21, 1964 and were admitted for the purpose of showing the effect upon steelmaking and steelmaking equipment of varying depths of penetration, and to provide a method for measuring penetration. (McLouth Main Brief After Hearing, PX-K-4 at page 90).

[234] Preliminarily, the Ann Arbor Demonstrations which concern us here were carried out in a 15 inch vessel.

1. With a charge of metal of approximately 270 pounds;
2. With equal flux conditions;
3. With a lance height of 7 inches, except for a 25 inch height in Demonstration No. 6;
4. With a starting bath temperature of between 2500° F — 2800° F;

5. With a bath depth of approximately 6.6 inches—6.8 inches; and

6. With a lance nozzle diameter of .316.

Later, I shall compare these conditions with those prescribed by the Suess patent, and shall further compare the results promised by each.

[235] Preliminary, and in short summary:

Demonstration No. 5 (McLouth DX-160) (PX-K-12-B p. 1863b) (PX-J-21 p. 7104-7118) was evidently designed to show that an oxygen jet blowing from a height of 7 inches and 20 psig penetrates at least to the center of the 6.6 inch metal bath.

Demonstration No. 7 (DX-280, PX-J-21 pp. 7127, 7137-7141) was designed to show that with a lance 7 inches above the bath, after two minutes of oxygen supplied at the rate of 20 psig to create a fluid slag, when the pressure was increased to 40 psig, and continued until the carbon end point, that such deep penetration would make a depression in the bottom of the vessel, while at the same time *ductile* steel was produced.

Demonstration No. 9 (PX-J-22 pp. 7285-7294) was designed to show that a brick in which a hole had been bored would be penetrated by raising the pressure from 20 psig to 40 psig, and that the oxygen jet would come through the hole, but that when the pressure was returned to the 20 psig, molten liquid would flow through the hole. Thus it presented evidence purporting to show that it was the oxygen jet which burned the hole through the refractory brick in Demonstration No. 9 and not the molten metal.

Demonstration No. 6 was conducted for the purpose of showing that the superficial application of the oxygen jet on the bath surface produced "a bad slopping condition and ineffectual operation." (PX-J-26 p. 8781).

Demonstration No. 8, which was conducted on a flat plate, **[236]** was not considered in the Opinion. However, it is

Demonstration No. 9 which received critical focus in the Opinion. In particular as it pointed up, isolated, and evaluated the credibility of Dr. Elliott's estimony.

Demonstration No. 9 was intended (PX-J-22 p. 7285):

> "... to show that the bottom marking of the converter is caused by the oxygen jet penetrating completely through the bath and not by a sinking column of hot metal."

The same conditions in the bath were used for Demonstration No. 9 as in the case of No. 5, except first that the bottom brick refractory had a hole partially drilled into it, leaving a thickness of 15/16ths of an inch from the bottom; and second, this demonstration started with an oxygen pressure of 20 psig and was raised after two minutes to 40 psig. The result was that fifty seconds later, the "flaming jet" could be seen "issuing beneath the bottom." The "flame" came through for about ten seconds until the pressure was cut back to 10 psig. (PX-J-22 pp. 7290-7292).

Dr. Flinn's recollection was as follows (PX-J-22 p. 7367):

> "But as I recall, after we had been at 40 psig, the pressure necessary to mark the bottom, after we had been at 40 psig for the order of forty seconds, we saw a *gas jet* coming through the bottom *in the form of a flame.*" (Emphasis added).

When it was turned back to 10 psig:

[237] "... we saw a metal stream coming out.

Then the pressure was raised again to 40 psig, and we again saw *the flame* coming through, because 40 psig, of course, was enough to have *the jet* penetrate to the bottom.

Then the pressure was shut off and the rest of the metal, or most of it, ran through the hole." (Emphasis added).

"The appearance of a *flaming gas jet* through the bottom of the converter proves that *the jet* penetrates to the bottom. Furthermore, the demonstration shows that *it is the jet* and not a downwardly descending stream of metal that cuts the hole through the bottom refractory brick." (Emphasis added). (DX-284 pp. 3, 4).

I take notice particularly that Dr. Flinn said he saw "a gas jet coming through the bottom in the form of a flame.", and it was "visible". This phase of the demonstration was not commented upon in the Opinion.

Dr. Elliott testified, inter alia, (PX-J-37 pp. 12363-12366) that the oxygen jet did not reach the bottom of the converter during this demonstration and that it, the oxygen, did not cause the hole in the bottom:

"If oxygen had reached the bottom, here should have been oxygen in the stream leaving the vessel . . ."

And,

". . . conditions would be right for this oxygen to burn the iron in the stream, the spraying stream . . ."

He gave certain reasons on a scientific basis for why this was [238] true.

While Dr. Elliott claims that the hole was caused by the CO bubbles on the bottom which resulted from the downwardly moving stream saturated as it was with carbon and oxygen, I observe also that Dr. Chipman testified (PX-J-3 pp. 501-504) that it was silicon and oxygen which combined in the metal to form silica, SiO_2 which became destructive to the bottom refractory as it struck it. He said (PX-J-3 pp. 503-504):

"Now, the formation of silica in contact with the refractory bottom—remember that we have a basic lining, the bottom is basic—the silica is acid. Silica is quite corrosive to basic refractories. This means, then, that if the hot spot is deeply immersed in the bath, the downward current can reach the bottom while it

is still at a high enough temperature to damage the bottom . . . In fact, it can put quite a hole in the refractory at the center of the bottom of the vessel."

OXYGEN DOES NOT BURN

First. For our purposes here it really does not matter whether Dr. Elliott's carbon monoxide theory, or Dr. Chipman's silica theory is correct. What impressed me is that two of the defendant's witnesses were authority for the fact that oxygen by itself will not burn a hole in the brick work. One witness was Lyle Johnson, Vice President of Engineering of McLouth Steel. The evidence on that point was (PX-J-33 p. 11, 100):

"A .....
On the 20th we ran Test 13, which was a test where we blew oxygen into an empty vessel onto bare brick. This test simply proved that oxygen by itself will [239] not burn a hole in the brickwork.

The Court: Was the brickwork heated?

A. Yes, the brickwork was heated.

The Court: To what temperature?

A. I would estimate the temperature was approximately 2000 degrees, your Honor."

Also, McLouth General Superintendent, Hotmill Division, Mr. Paul Lindberg, contradicted Dr. Flinn's assertion that it is oxygen and not metal of extremely high temperature hitting the bottom which causes the refractory damage, when he testified as follows (PX-J-12 p. 3583):

"Q. That bottom marking is caused by the metal of extremely high temperature hitting the bottom, is it not?

A. Right underneath the oxygen lance, that is correct, sir.

Q. My statement is correct, that that marking is caused by the extremely hot metal?

A. That's correct, sir."

Thus, accepting the testimony of defendant McLouth's own witnesses, if the Demonstration No. 9 vessel had been devoid of metal, the oxygen when applied alone would not have burned a hole through the bottom.

We recall that Dr. Flinn said throughout this testimony that he saw the oxygen "in the form of a flame" and that "it was a flame". From this testimony we observe that at no time did Dr. **[240]** Flinn say that he saw a pure jet of oxygen extruding from the bottom of the refractory. He saw a "flame", and if he saw a "flame", it was a combustion—a combination of oxygen with some one or more of the oxidizable impurities contained in the bath in Demonstration No. 9, consisting of what we have learned in this case was iron, silicon, manganese, sulfur, phosphorus, carbon and other impurities.

From the specification itself we learned (col. 4 commencing with line 43) that because of the very high affinity of oxygen for molten iron, their combination creates an ignition which is visible in the form of a flame within the first minute of blowing, and that combination of oxygen with other chemicals in the bath soon develop the extremely high temperatures approaching the boiling point of iron.

Since Dr. Flinn testified that he saw a "flame" protruding from the bottom, it is inevitable that he did not see the oxygen jet protruding from the bottom. In fact, if it were pure oxygen, neither Dr. Flinn nor anyone else would have been able to see it; because it is common knowledge that oxygen is non-metallic, colorless, odorless, tasteless and inflammable.•

Dr. Flinn said it was "visible". It was a "flame". It was a "flaming jet". It was "coming through the bottom in the form of a flame."

•Chemistry Made Simple, Fred C. Hess, page 111, published 1955.

[241] As for the flame from the bottom of the vessel in Demonstration No. 9, Dr. Flinn said (PX-J-22 p. 7291):

> "A. We will see a high velocity flame coming through the bottom.
>
> THE COURT. What will be the color of the flame.
>
> A. It will be ——
>
> THE COURT. Blue?[39]
>
> A. No. It will be rather bright orange-red, your Honor."•

We note also that throughout the entire *McLouth* record there is no disagreement with the explanation of the oxidizable impurities existing in a molten metal bath, and that these combine with oxygen and produce high temperatures. Whether the refractory burning was produced by the high temperature of the oxidation-reaction of either carbon or silicon, or any other oxidizable elements in the bath, it definitely could not have been produced by the oxygen jet alone.

[242] In Demonstration No. 9 we are concerned with the destruction of the bottom refractory and the reasons for its destruction. In accordance with the teachings of the Suess process, it seems that the burn-through could have

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[39] The District Court could have thought of this in the same way as one commonly thinks (but does not always check) about the flame in a burner of a gas range. When the mixture of gas is too rich, it will burn yellowish to white, and when it has an adequate amount of oxygen it has a bluish flame. However, it will be remembered that it is the proper amount of oxygen which oxidizes almost completely the hydrogen and produces the bluish flame.

• "The flame produced by combustion consists of burning gases vaporized from combustible substance by heart of the reaction. The flame may be colored by energized ions emitting light energy as well as by bits of solid material heated to incandescence by the reaction energy." Chemistry Made Simple, Fred C. Hess, page 111, published 1955."

resulted when the hot spot or localized reaction zone moved from the surface and projected into the interior of the bath contrary to the instructions contained in the Suess specification. Consequently the bottom of the refractory lining was destroyed.

What we have examined here was only whether or not oxygen could have burned the bottom of the refractories, and I conclude that this should not have been used as a basis for discrediting Dr. Elliott's testimony.

35-40% versus 22%

SECOND. The first discredit ascribed in the District Court Opinion to Dr. Elliott on the basis of the "tangible evidence," Demonstration No. 9, is that he ". . . defined deep penetration by reference to such bottom damage (R. 6168-6169) . . . when the jet enters more than, say, 35 to 40 percent of the bath depth . . . [and] would have regarded the penetration in demonstration No. 9 as being at least 35 to 40 percent of the bath depth. Yet he later testified that the penetration of the jet in demonstration No. 9 was no more than 1.5 inches of a 6.8 inch **[243]** bath depth, or approximately 22 percent of the bath depth (R. 12,382, 12,610)." (257 F.Supp. at page 435).

The difficulty is that this statement as made here is erroneous because it compares two different sets of circumstances. As I first look at these two situations, I am alerted to the fact that the first is transcribed at PX-J-19 pp 6168-6169 while the second situation is transcribed at PX-J-37 pp 12,382, 12,610. As stated, it tells the reader "that Dr. Elliott would have regarded the penetration in demonstration No. 9 as being at least 35 to 40 percent of the bath depth." Nowhere in the record is there any evidence which could be imputed to Dr. Elliott that he stated or inferred or that he "would have regarded" such a percentage of depth in the demonstration No. 9 bath. On the other hand, his record testimony as related to Demonstration No. 9 was that (PX-J-37 pp 12,380-12,381):

> "The pressure was high . . . the oxygen flow . . . gave an enormous oxygen input . . . for a bath 6.8 inches deep and of a few hundred pounds."

And further, that (PX-J-37 p 12,382):

> "The indent *under these blowing conditions* would range between 6/10ths of an inch to approximately 1½ inches. 6/10ths of an inch to approximately 1.5 inches." (Emphasis added)

The District Court calculated this to be 22 percent depth of penetration by the oxygen jet. But regretably, the District **[244]** Court mismatched this 22 percent with the 35-40 percent depth of penetration in a totally different set of circumstances and arrived at a mis-interpretation upon which it misjudged the credibility of Dr. Elliott.

Under a completely different set of circumstances, Dr. Elliott testified that anything beyond 35-40 percent depth of penetration would be considered by him to be deep penetration contrary to the conditions prescribed by the Suess specification. This was related as an answer under cross examination (PX-J-20 p 6637):

> "*Under normal conditions indicated in the patent,* I would consider that deep penetration arises when the jet enters more than, say 35 to 40 percent of the bath depth." (Emphasis added).

Whereas, "the penetration in demonstration No. 9" was not "regarded . . . as being 35 to 40 percent of the bath depth." The misconception or mis-interpretation here of such a comparison was like comparing apples with pineapples—and what a difference it would make to anyone who wished to bite into an apple but inadvertently bit into a pineapple.

Dr. Elliott testified here (CE p. 257) that the Court misconstrued his testimony. He testified:

> "I would like to call [this] Court's attention to the statement at the top of the page 6637 **[245]** [McLouth]

> which says in my answer to a previous question, 'Under normal conditions indicated in the patent, I would consider that deep penetration arises when the jet enters more than say, 35 to 40 percent of the bath depth.' And that line, 'Under normal conditions . . .' is the important part of the statement . . . Now, the discussion [of the McLouth District Court] goes on to say, 'Yet he later testified that the penetration of the jet in demonstration No. 9 was . . . approximately 22 percent of the bath depth." (CE pp. 257-258)

Dr. Elliott then explained that he had testified that Demonstration No. 9 was unusual in that the oxygen input ". . . was enormous under these blowing conditions relative to the size of the bath . . . So, accordingly this is an abnormal operation, and the discussion in the opinion does not recognize the fact that I was talking about a normal condition under one circumstance and a very abnormal one under another; and, hence, I conclude that there is a technical misunderstanding." (CE pp. 258-259)

Thus, this fundamental misunderstanding of the *McLouth* District Court arose from that Court's attempt to equate deep penetration with an operation under highly contrived, experimental conditions.

In addition, it must be observed that the diameter of the nozzle used in the Ann Arbor demonstrations was .316 inches, for a weight of approximately 270 pounds. Calculating the proportion of what 270 pounds bears to a ton or 2,000 pounds, the result **[246]** will be .135. Multiplying .135 against the .04 inches prescribed by Suess gives us .0054, or the diameter in inches usable for 270 pounds. Comparing the diameter used in Ann Arbor of .316, for the 270 pounds, we divide .316 by .0054 and get the result of 58. *Thus we find that the .316 diameter for 270 pounds of melt is 58 times as much as that prescribed by Suess.* Accordingly, we see that in the continued demonstrations 58 times as much oxygen was introduced into the baths as was prescribed by the Suess specification. And while the

facility, and therefore the possibility existed for the introduction of 58 times as much oxygen in the demonstrations, that in itself might not have been proof that it in fact was introduced. I, accordingly, further examined the record to determine the amount of oxygen consumable under Example 1 of the Suess specification, and Demonstrations Nos. 7 and 9, and obtained these results.[40] Since excessive **[247]** disproportions exist between the oxygen consumed, we may fairly conclude two things: (1) that the large amount of oxygen, both capable of being introduced and, in fact, actually introduced into the bath, oxidized the bath impurities in a greater proportionally speedier time in both Demonstrations Nos. 7 and 9; and (2) that the demonstrations, being so excessively disproportionate to the Suess process instructions, would by reason thereof be legally incompetent evidence to discredit the Suess patent.[41]

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[40] The consumption of oxygen in Demonstration No. 7 proved by calculation to be approximately 27 times the amount recommended in Example 1 of the Suess patent, as that was calculated; while the consumption of oxygen in Demonstration No. 9 (as far as it went) was approximately 22 times the amount recommended in the Suess example 1, as both were calculated. To avoid any misunderstanding in this I repeat some of the calculation heretofore made and add the necessary part as follows:

> The theoretical consumption of oxygen for 270 pounds as calculated from Example 1 of the specification was 8.58 cubic feet. In Demonstration No. 7, 235 cubic feet (DX-281) of oxygen were consumed by a charge of 270 pounds. Thus, by dividing the theoretical value 8.58 into the actual amount of oxygen used, 235 cubic feet, it is found that the defendant used about 27 times the oxygen specified by the patent. Demonstration No. 9 can also be seen in similar terms. By taking the amount of oxygen consumed, 186 cubic feet (DX-285) and dividing the theoretical value of 8.58, it is seen that this experiment consumed about 22 times the recommended oxygen volume.

[41] Though I recognize that the *McLouth* plaintiffs stated in their brief (PX-K-1, p. 176) and in court (PX-J-3, p. 691, PX-J-8, p. 2475, PX-J-20, pp. 6417A-6420, 6423-6424, 6435-6436, 6442) that the

Accordingly, by reasons of such misunderstanding Dr. Elliott should not have been charged with a discredit in this connection; and, in justice, it could not have been used even as a fractional support for the District Court's observation that the Ann Arbor Demonstration No. 7 was to any degree "tangible evidence in the record tending to confirm that the concept of material agitation by the oxygen stream is a fiction." (257 F.Supp. at page 433) This determination corroborates the testimony of Dr. Elliott given here (See CE pp. 234, 295).

Comparison of End Results

THIRD. Because the burden rested on the defendant, it cannot be concluded that the steel produced in the Ann Arbor Demonstrations was of open-hearth quality. Dr. Flinn said the quality of steel produced in Demonstration No. 5 (PX-J-22 p 7377):

[248] "A. . . . shows the characteristic *ductility* of low carbon steel." (Emphasis added)

As for Demonstration No. 7, Dr. Flinn said (PX-J-22 p. 7379):

". . . we have bottom burning but we still make steel." But what kind of steel? Nothing was said about the quality of steels blown in the 185 seconds of demonstration No. 9.

There is no evidence in the McLouth Record that the Ann Arbor Demonstrations, particularly Nos. 5 and 7, both produced steel equal in quality to those with regular operations OP-1 and OP-2 at McLouth.

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teachings of 1 mm per ton of charge applied only to charges of approximately 35 tons, I also note that the purpose of Defendant's demonstrations was to prove that *patent* fallacious. Further, even assuming arguendo that the above calculations are not a precise indication of the relatively enormous amount of oxygen used in the tests, there is ample undisputed expert testimony that the quantity of oxygen supplied was excessive (infra page 243).

Dr. Flinn informed us (M DX-160—PX-12-B p. 1864b) that the silicon and "most of the manganese had been eliminated", but we are told nothing at all about the sulfur and phosphorus removal which is, according to all the steelmen for both the plaintiffs and the defendants, (as well as the defendant J & L), frustrated when the oxygen is injected deeply into the bath because it defeats the capacity of FeO to move into the slag and eliminate the phosphorus and sulfur (See. Dr. Elliott's testimony (PX-J-19 p. 6170) (257 F.Supp. at pages 388-389). Most important of all, there is not a single word in the *McLouth* record that any of the resultant products obtained from the Ann Arbor demonstrations produced "steels having analyses and qualities at least comparable to that of basic open-hearth **[249]** steels", as is the object of the Suess process (PX-1, col. 3 lines 4-5). That the Suess process has achieved this object has never been disputed by a single word in the entire *McLouth* record, in spite of the fact that McLouth, defensively asserted that Schwarz, Miles and Gerlafingen had already done so before.

If the Ann Arbor Demonstrations were intended to prove that the quality of steel in any of these demonstrations, Nos. 5, 7 or 9 were comparable to the products produced by the Suess refining process "which is applicable to pig iron of widely varying chemical compositions, including in particular pig iron of analyses used in ordinary basic open-hearth practice, as well as those of higher silicon and phosphorus content required for blowing in the acid Bessemer and basic Thomas converter processes to produce steels having analyses and qualities at least comparable to that of basic open-hearth steels" (PX-1, col. 2, lines 69-72 and col. 3, lines 1-5), there was no show of any such proof in the record. Demonstration No. 5 produced "ductile" steel and Demonstration No. 7 produced "good" steel. However, such is not good enough, for by narrowly specifying their quality or characteristics McLouth excluded them from the general class of "steels hav-

ing analyses and qualities at least comparable to that of basic open-hearth steels". *Inclusio unius est exclusio alterius.*

[250] The word "good" as used here is at most descriptive of only a questionable quality in the finished steel. The word "ductile" as it relates to metal contains a wide range of significance all the way from soft tin or gold to carbon steel or alloyed chromium steel. As the record here shows, "ductility" is but one of the many virtues required in industrial steel. Other properties are hardness, ability to be machined, brittleness, electric conductivity, magnetic permeability, magnetic hysteresis, permanent magnetism, and weldability.*

It is common knowledge that strength is steel's primary virtue. Of course, the true value in iron refinement into steel lies in the controlled and limited elimination of unwanted elements, such as silicon, sulfur, phosphorus, carbon and the like. When we look at the "good" steel or the "ductile" steel coming from the Demonstrations Nos. 5 and 7 at McLouth, we should look to the total comparison of these products with those resulting from the Suess process. Unfortunately, a complete comparison is not part of the record.

It should also be observed that the tests at Gerlafingen produced poor quality steel by reason of the practice of deeply deploying the oxygen into the bath as in the prior art of Miles and Schwarz with resulting high percentage of sulfur, and of the recital of the McLouth District Court of the difference in the **[251]** tests at Linz, Austria. (257 F.Supp. at page 410 et seq.)

Since the composition of finished steel as it is accomplished in the open-hearth process depends upon its free-

* The Making, Shaping and Treating of Steel, Ninth Edition (1971), published by United States Steel, at pages 1231, 1275, 1136, 1206, 1162, 1137 and 1054.

dom from various undesirable impurities, or the inclusion of certain elements such as chromium for special purposes, the control of the process is vital. Aside therefore from a showing that Demonstration No. 5 produced .10 percentage carbon, it furnishes no evidence whatsoever of comparability with the open-hearth or the Suess process for that matter, nor with McLouth's own OP-1 and Op-2 operations. (See p. 253-254) Neither is there any indication in the record that the demonstrations could have been controlled so as to provide some similarity or comparability of controlled finished products as in the open-hearth as does the Suess process.

As for the quality of the product produced in Demonstration No. 7, we have no further information than that given in Demonstration No. 5, and no information that nozzles and refractories in Demonstration No. 5 and No. 7 were damaged. While these may not have been damaged, the absence of evidence of the quality of steel produced would give the processes very little more credibility beyond that of Gerlafingen or of the prior art **[252]** of Schwarz or Miles. Thus these processes under Demonstrations Nos. 5 and 7 would be considered unacceptable processes under Suess. The only blame we might give these two demonstrations, Nos. 5 and 7 for poor production quality would be in either an overabundance of oxygen because of the great width of the nozzle or in the greater depth of penetration by which the hot spot was moved from the top center surface as instructed by Suess to the center of the bath, thus creating the condition by which the Suess prescribed chemical process was disrupted.

It is also obvious that at least the character or quality of steel produced in Demonstrations Nos. 5 and 7 was not brought to the attention of the *McLouth* District Court, or for some reason went unobserved; because there is no mention or discussion of this in the Opinion. This factor also indicates a lack of comparability shown by Demonstrations Nos. 5 and 7 to the Suess process, as well as to

McLouth's OP-1 and OP-2. Such a showing was part of defendant's burden.

McLouth's Defendant-Appellee's Appendix Volume 11 (PX-K-12-B) shows that in the general mills at McLouth the finished production is variably controlled in order to produce either a minimum or maximum of wanted or unwanted impurities, particularly carbon, where the same is desired. Our concern is whether or not Demonstrations Nos. 5 and 7 produced steel **[253]** comparable to the open hearth capabilities, but in the very least to the capabilities of McLouth's OP-1 and OP-2 which claims to produce steel "of a quality comparable to that produced by the open hearth process." Thus we are able to see from the record of McLouth that the raw production and the finished production of OP-1 are as follows (PX-K-12-B p. 1755b):

RAW PRODUCTION

Element	*Percentage Range*
Carbon	4.2 to 4.6 %
Manganese	.70 to 1.30
Silicon	.75 to 1.30
Phosphorus	.14 to .19
Sulfur	.019 to .050

FINISHED PRODUCTION (PX-K-12-B p. 1765b)

Element	*Percentage Range*
Carbon	.04 to .30%
Manganese	.20 to 1.20
Phosphorus	.030 max.
Silicon	.30 max.
Sulfur	.030 max.

The raw production and finished production at OP-2 are as follows:

RAW PRODUCTION (PX-K-12-B p. 1828b)

Element	*Percentage Range*
Carbon	3.75 — 4.25%
Manganese	0.40 — 1.70
Silicon	0.50 — 1.70
Phosphorus	0.11 — 0.19
Sulfur	0.010 — 0.050

[254]

FINISHED PRODUCTION (PX-K-12B p 1838b)

Element	*Percentage Range*
Carbon	0.04 — 0.60 %
Manganese	0.16 — 0.40
Phosphorus	0.030 max.
Sulfur	0.030 max.
Silicon	0.30 max.

From this record it is obvious that the furnaces in both OP-1 and OP-2 at McLouth are variably controlled to produce finished steel of specific character and content. In fact, McLouth states for both OP-1 and OP-2 (PX-K-12-B pp. 1739b and 1811b) the following:

> "The oxygen steel process practiced by the McLouth Steel Corporation at its Trenton, Michigan plant is normally used to refine molten pig iron from McLouth's blast furnace[s] into low or medium carbon steel of a *quality comparable to that produced by the open hearth process.*" (Emphasis added)

This is an assertion that it does produce steels of such quality as is claimed by the Suess process.

The purpose of examining these "before" and "after" contents in these OP-1 and OP-2 operations is to indicate the absence of similar statistics in the input and output of Demonstrations Nos. 5 and 7, notwithstanding the assertions of its experts of the production of so-called "ductile steel" or "good steel" by these demonstrations. Nowhere in the record did McLouth make claim that the

quality of "good" or "ductile" steel produced in Demonstrations Nos. 5 and 7 were "comparable to that produced by the **[255]** open hearth process," or even to their own processes at OP-1 and OP-2.

I notice one other failure to produce evidence that I would have considered persuasive or lacking in persuasiveness in the *McLouth* trial. Although there are records of the number of blows which the refractories at OP-1 and OP-2 can accommodate, there is no evidence of length of wear in the operations conducted as Demonstrations Nos. 5 and 7. As for No. 7. The indication is that it was damaged by reason of the 40 psig jet pressure.

There is no doubt that the Ann Arbor Demonstrations were not models of the Suess process, or examples of the process as it was described and instructed in the Suess specification, or as practiced at McLouth. Consequently, the critical failure on the part of the defendant to meet its burden, negates any inference drawn from the Ann Arbor demonstrations.

Evidentiary Substance of Ann Arbor Demonstrations

FOURTH: The purpose of presenting the Ann Arbor demonstrations by McLouth was to show that in Demonstration No. 5, penetration at least to the center of the 6.6 inch metal bath was appropriate; that deep penetration by the oxygen jet at double pressure in Demonstration No. 7 would make a depression in the bottom of the vessel, while at the same time "ductile steel" was produced; and **[256]** in Demonstration No. 9 that the refractory bottom was destroyed by the oxygen jet and not by the molten metal.[42] However, nothing was said by the defendant McLouth about "material agitation of the bath by the oxygen jet."

[42] These demonstrations were apparently an effort by McLouth to corroborate their contention that in their OP-1 and OP-2 oxygen blowing operations, they peneterated the jet deeply into the bath in accordance with the Schwarz and Miles patents. The District Court disagreed, and held that they practiced the Suess Process. (257 F.Supp. at page 386).

And yet, relying upon Demonstration No. 7 as a support, the Court found that the "material agitation" mentioned in Claim 1 was non-existent and a fiction.

This conclusion was based upon Demonstration No. 7 where "the agitation of the bath as shown by the throw-out subsided near the end of the blow, although the action of the oxygen jet remained constant . . . It is obvious, therefore, that the action of the oxygen stream alone was not responsible for the agitation of the bath causing throw-out"; that "Demonstration No. 7 illustrates that even with deep penetration of the bath by the jet, such agitation . . . results from *chemical reactions,*" and not mechanical action of the jet; and, that "if deep penetration as well as non-deep penetration fails to bring about **[257]** an agitation of the bath by the oxygen stream, as in Demonstration No. 7, then there can be no logical correlation between the avoidance of deep penetration and the avoidance of material agitation of the bath by the oxygen stream". (Emphasis added) (257 F.Supp. at page 434).

Thereafter the Court linked Dr. Elliott to certain references which he had made to the specification and concluded that this was done in an effort to equate avoidance of deep penetration with material agitation, but that no such correlation was taught in the specification; that Dr. Elliott had "himself relied on the quieting of the bath at the end of the blow as in demonstration No. 7 as a sign of avoidance of material agitation of the bath by the oxygen stream"; and that Dr. Elliott's testimony did not present "a clear or consistent meaning" because he testified that the refractory walls were damaged as a result of an upward moving stream of hot metal and the bottom refractory was

damaged as a result of downward moving hot metal in the center of the bath. "Clearly circulation cannot be both up and down in the center at the same time." (257 F.Supp. at page 435)[43]

[258] Then, of course, the second reason for Dr. Elliott's "inconsistent definitions of deep penetration, as illustrated by defendant's demonstration No. 9" was that Dr. Elliott had given two contradictory definitions of deep penetration."

In examining the reasoning of the Opinion as it relates to demonstration No. 7, it will be seen that the word "if" is used three times in its structuring. First (at page 434) in the fifth and sixth lines, the Opinion said "If the bath agitation . . ." Second, in the twenty-fourth line, it says "But material agitation by the oxygen stream . . ." Third, in the thirty-seventh line, it said "But if deep penetration as well as non-deep penetration fails . . ."

First of all let us examine the fact that the Opinion relates the quieting of the bath at the end of the blow as occurring because of cessation of chemical reaction. If the District Court had taken this thinking from the phraseology contained in the specification on that very point, it could not be more accurate. This is what the specification says (col. 6, lines 66-72):

[259] "When the flame dies and carbon combustion is completed, the bath becomes relatively quiet and intimate contact between slag and metal bath ceases. The turbulence of the bath and slag due to the oxygen stream impinging from directly above is insufficient to cause continuance of oxygen-metal reactions."

So that when the Opinion states, "If the bath agitation causing such throw-out of metal and slag had been caused

[43] I discuss this phase at Compendium *XIV*.

[44] I discuss this under this Chapter, pages 243-244.

by the mechanical action of the oxygen stream alone, the throw-out would not have ceased as it did near the end of the blow" (257 F. Supp. at page 434), it presumed upon that which the specification did not say. And when the Opinion further states that, "It is obvious, therefore, that the action of the oxygen stream alone was not responsible for the agitation of the bath causing throwout of metal and slag during the major part of the blow", (257 F.Supp. at page 434), it stated that which the specification almost verbatim states. Then when it concludes that "Demonstration No. 7 illustrates that even with deep penetration of the bath by the jet, such agitation of the bath as may occur results from chemical reactions rather than the mechanical action of the oxygen jet upon the bath" (257 F. Supp. at page 434), it verifies not only the Suess process chemistry but the prior art as well. But when it reasoned that, "Applying *plaintiffs' own argument,* 'material agitation of the bath by the oxygen stream' was also [260] avoided in demonstration No. 7 despite deep penetration of the bath by the oxygen jet" (Emphasis added) 257 F. Supp. at page 434), it relied upon an unfounded presumption. So that when it furthered the next two presumptions contained in the rest of the paragraph, as they commenced with "but if", they are regrettably not based upon facts, because material agitation by the oxygen stream is not "avoided, even with deep penetration" and "such agitation" is not apparently always avoided when blowing vertically regardless of the depth of penetration and "deep penetration as well as non-deep penetration" does not fail to bring about an agitation of the bath by the oxygen stream as in Demonstration No. 7 (257 F.Supp. at page 434). To the contrary, the plaintiffs' argument was always that deep penetration by the oxygen jet did cause material agitation in the bath. It was, regrettably, unknown to the *McLouth* Courts that this was the specific idea concerning the deliberations in the Patent Office on May 1, 1957 before the patent issued. The words of the Primary Examiner,

Claude A. LeRoy, in evidence presented to me at the first post-trial hearing, bear repetition here. (PX-1002 pp. 9-10):

> ". . . we had considerable discussion as to the positive manner in which they would define that feature of having the penetration extended down into the bath, just a rather insubstantial **[261]** distance as far as the prior art was concerned. It was well understood in the art that deep penetration meant a considerable distance into the bath and they wanted to avoid that concept, so I tried to bring their—bring to their cognizance that it was a localized penetration, and *so the language that we finally adopted* was to bring out that feature. (Emphasis added)

Under the circumstances, it would be highly unlikely that the "plaintiffs' own argument" would be that 'material agitation of the bath by the oxygen stream' was also avoided in demonstration No. 7 despite deep penetration of the bath by the oxygen jet." (257 F.Supp. at page 434).

Assumption

Nevertheless, the opinion continued to carry through the assumption and related it to Schwarz and Miles in this language:

> "And *if* the language of the patent in suit referring to the avoidance of material agitation covers the actual practice of steelmaking under the Schwarz and Miles patents, then plaintiffs can hardly rely on such language of the claims as a characteristic of the process essential to novelty. In other words, if Schwarz and Miles avoided material agitation of the bath by the oxygen stream even with deep blowing, then such avoidance of material agitation by the oxygen stream cannot be considered a significant feature of the claims of the patent in suit." (257 F.Supp. at pages 435-436) (Emphasis added).

Here we see a structuring of assumptions again in the Opinion inter-connecting a series of phases. First of all

"the **[262]** language of the patent in suit" not necessarily the exact words in the claim "referring to material agitation" does *not* cover "the actual practice of steelmaking under the Schwarz and Miles patents". In fact the opposite is true, both Schwarz and Miles practiced using the oxygen jet or jets, as the case may be, to *stir* the bath by deep blowing, angular blowing, non-vertical blowing, non-central blowing, or multiple jet blowing or by blowing pulverulent or fuel materials, and thus procured maximum material agitation of the bath.[45] Therefore, Schwarz and Miles did not avoid material agitation, but rather taught it as a necessary part of their processes to be accomplished with deep blowing. The opposite is true of Suess. Therefore, the opposite conclusion which eventually and actually achieves the "avoidance of material agitation by the oxygen stream" can be considered significant features of the claims of the patent in suit.

[263] From this we see that there are at least two phases interconnecting: (1) the vertically, centrally and surface placed localized reaction zone by Suess, and (2) differentiation from the prior art, especially Miles. And we now see that the two cannot be separated; for if there is no localized reaction zone as instructed in Suess, there consequently results unwanted stirring of the bath by the jet. If the instructions contained in the specification are not followed, we may have a too light impingement of the jet which would cause slopping; and, further, if the instructions are disregarded and the jet is discharged even within the specified limits but off center, or diagonally or provided with too much pressure or placed too deeply or too close to the surface, the localized reaction zone or hot spot is dislocated

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[45] This does not include the necessary Suess instruction providing for ratio of bath depth to bath diameter or nozzle diameter (PX-1 col. 4, lines 7-25; PX-1, col. 3, lines 58-60). By the term "deep blowing" I have excluded the general Suess instructions as to height of nozzle, pressure of nozzle and the like.

from the top center surface of the bath where it is fixedly featured by the Suess specification.

Under any or all of these circumstances there is no localized reaction zone at the center surface of the bath: in the case of a too low pressure, an insufficient impingement with the metal and too much impingement with the slag; and in the case of the off-center, diagonal, or too heavy pressure, no localized hot spot in the central surface of the bath, but instead an elongated oxidizing instrumentality which diffuses the high **[264]** temperature area in the direction in which the jet is pointed. In all these instances, the oxygen jet is mechanically applied and so the oxygen jet materially creates the agitation indicative of prior art in these instances and against which the terminology in Claim 1 cautions. All of this offers further substantiation that the plaintiffs could not contend that "material agitation of the bath was also avoided in demonstration No. 7 despite deep penetration of the bath by the oxygen jet."

The last quoted "but if" assumption seems to be based upon a slender conclusion of one of the phases which the plaintiffs' expert witnesses submitted on the 3000-8000 units of chemical force or power versus the 1 unit of physical jet force or power. Whereupon the District Court found that:

> "Plaintiffs take the position that material agitation by the jet is avoided unless a down in center circulation induced by chemical reactions is overcome by the force of the jet (E.g. Main brief, pp 191-194; R. 13,331-13,332)." (257 F.Supp. at page 435),

and arrived at the assumption that

> "But if such material agitation is avoided whenever a reaction induced circulation is not overcome by the mechanical action of the jet, then . . . the language referring to the avoidance of material agitation by the jet is merely extraneous." (257 F.Supp. at page 435).

It then goes on to say that

> ". . . the real reason for the inclusion of language in the claims of the patent in suit concerning the **[265]** avoidance of material agitation by the jet was the desire by the applicants to distinguish the prior art Miles patent, . . ." (257 F.Supp. at page 435).

This purpose, as I have already discussed it, does not discredit the patentees, but rather supports their purpose in fact and law. *Eagle Iron Works* v. *McLanahan Corp.*, 429 F.2d 1375, C.A. 3, 1970; *Epstein* v. *Dennison Mfg. Co.*, 314 F.Supp. 116 (D.C.N.Y., 1969).

Thereupon, the Opinion concluded:

> "In effect, the specification of the patent in suit presented a new theory of agitation caused by chemical reactions, and the claims referred to an avoidance of agitation by the jet to give the impression of an entirely new steelmaking process." (257 F.Supp. at page 435).

Here again we see a misapplication in the use of words, because "the specification of the patent in suit" did *not* present "a new theory of *agitation* caused by chemical reactions", but rather the specification presented a new theory of circulation caused by chemical reaction. Additionally, the claims referred to the method of producing that chemical circulation and the reference to "an avoidance of agitation by the jet" only reflected the detailed instructions given in the specification "of an entirely new steelmaking process". Therefore, it seems that the Opinion misapprehended and interchanged the thought **[266]** contained in the specification with a part of the wording of the claim by the use of the word "agitation" and related it to "chemical reactions". The only thing that the specification and the claim indicate is that there is a physical function for the operator, and a resultant chemical reaction thereafter. The claim after a proper reference to the subject matter, offers further guidance to the operator to so

discharge the stream of oxygen within limits of pressure vertically, downwardly through the slag layer onto and below the surface of the bath at the central portion thereof "to an extent to avoid material agitation of the bath by the oxygen stream" (col. 12 commencing with line 12), so that such contact of the oxygen with the bath results in the reaction which produces chemical results in accordance with the instructions of the specification.

After having built upon its adopted assumption, the Opinion continues:

> "However, if material agitation by the oxygen stream is a fiction, as defendant's demonstration No. 7 and other evidence strongly suggest, then even under the process as taught by Schwarz and Miles, chemical reactions rather than the mechanical action of the jet must have been the actual cause of agitation in the bath. At least plaintiffs have failed to prove otherwise." (257 F.Supp. at page 435).

This ignores the constant efforts of the plaintiffs to establish their theoretical belief and contention that the oxygen-reaction **[267]** process is the chemistry which produces the pattern circulation in the bath by virtue of the Suess patent specification instructions. And from the Opinion's words "at least plaintiffs have failed to prove otherwise", by virtue of the voluminous proof in the case it can only be that the fact finder never realized it was there. Furthermore, the burden "to prove otherwise" was upon the defendant and not upon the plaintiffs. *Radio Corp. of America* v. *Radio Engineering Laboratories,* 293 U.S. 1, 7 (1934); *United Mattress Machine Co., Inc.* v. *Handy Button Machine Co.,* 207 F.2d 1, C.A. 3, 1953.

I have previously discussed the loose interchangeability of the word "agitation" particularly as it was used in the Opinion in connection with Demonstration No. 7, and as it was related to "throw-out" with the word "turbulence" as it designated bath action from whatever sources. I have

observed the word "agitation" was also loosely interchangeable with significance of the word "agitation" in its physical sense as it was used in Claim 1. As demonstration No. 7 is now here being used to discredit Dr. Elliott's testimony, the word "agitation" is used to embrace totality of action both in and out of the bath—as it was visible during the conduct of the blow. Thus it included both 20 psig blowing and 40 psig blowing with the nozzle presumably **[268]** directed both vertically and centrally onto the bath. When in the sense of Schwarz, the nozzle is being used as "a kinetic energy that . . . is capable of penetrating deep in the manner of a solid body, into the liquid baths." (DX-5-A, page 5, lines 24-25, page 6, line 1); and in the sense of Miles "The jet serves to circulate and agitate the metal and the slag . . ." (DX 10-A, page 18, lines 8-9). Thus demonstrations Nos. 7 and 9 were prior art operations.

Prior to the grant of the instant Suess patent, one of the applicants, Dr. Hauttmann, filed an affidavit with the continuation-in-part application in which it was stated, inter alia, ". . . our concept of securing purification of the entire contents of the bath mainly by the *controlled circulation induced by the reaction center* is just the opposite of trying to carry the oxygen to all parts of the bath by *agitation produced by deep penetration* • • •" (Emphasis added) (DX 2-A page 92). Thus the term "agitation" produced by deep penetration had significance to the applicants and to the Patent Office as well, but it is doubtful that it would have any significance to one not expert in the art of steelmaking.

The distinction between the "physical" turbulence and the "chemical" turbulence was explained in the first post-trial hearing before me by Byron T. Gardner who prosecuted the **[269]** continuation-in-part application before the Patent Office as follows: (FWE, at pages 17-18):

> ". . . In the Miles process, the oxygen jet was blown at high velocity against the surface of the molten bath

so it would penetrate almost to the bottom of the charge with the result that the oxygen was distributed completely throughout the molten charge, producing great *physical turbulence* as compared with the *chemical turbulence* and supposedly producing a very complete reaction and purification of the bath. As a practical matter, it didn't work that way. The *mixing* or *agitation* of the bath by the oxygen stream developed very high temperatures throughout the entire bath with the result that the walls of the converter or vessel formed of refractory material was badly eroded and only a relatively small number of charges of molten metal could be refined before relining was necessary." (Emphasis added)

Accordingly, we see that demonstration No. 7, with the exception of the placement of the nozzle vertically and centrally, was conducted in accordance with the teachings of the prior art. However, what was observable to the expert, Dr. Elliott, as the distinction between "chemical turbulence" and "physical turbulence" due to deep penetration in Demonstration No. 7, was not apparent to the non-expert senses of the District Court, in spite of the fact that uncontradicted expert testimony of that condition was presented in evidence to the District Court.

Although the testimony was directed in relation to Demonstration No. 9, and the 40 pounds driving pressure exerted there, it was also related by the witness to Demonstration No. 7 [270] in which the 40 pounds driving pressure was used and the heat was completed "in a very few minutes".

Demonstrations Nos. 7 and 9 were presented by McLouth to illustrate the effects of 40 psig blowing. A portion of Dr. Elliott's testimony was as follows (PX-J-37 pp. 12,380-12,381):

"... we are talking now of 40 pounds driving pressure with a 6.8 inch bath depth, and a good vigorous reaction going on in the system.

THE COURT: Is there anything unusual about the combination of those conditions?

A. It is an enormous rate at which the—the oxygen input was enormous under these blowing conditions relative to the size of the bath, the quantity of metal in the bath. As I remember it, the blowing conditions led to a completion of the heat in one of the other demonstrations in a very few minutes . . . And the resulting oxygen flow was very large . . . The pressure was high, but my basic point is that the oxygen flow resulting from that pressure on this nozzle gave an enormous oxygen input. My answer focuses on the rate of supply of oxygen as a result of the blowing conditions. This rate of supply was very large for a bath 6.8 inches deep and of a few hundred pounds."

While this testimony of Dr. Elliott remains uncontradicted in the record, no reference was made to it in the Opinion where it went disregarded.

[271] XIV. Up and Down at The Same Time

The second discredit ascribed to Dr. Elliott was to his testimony wherein he said that "deep penetration causes an up in the center circulation, which may cause refractory wear on the walls near the bath surface (R. 6146-6156; PX-349)," and when "he later testified that deep penetration causes bottom damage to the refractory (R. 6166) as the result of a downward moving stream of hot metal in the center of the bath (R. 12,340-12,343, 12,363)." With this discredit ascribed to Dr. Elliott, the finding was made that, "Clearly, circulation cannot be both up and down in the center at the same time." (257 F.Supp. at page 435)

Here again we see another case of mistaken circumstances where there is a mismatching of apples and pineapples. The first clue which we have of this misunderstanding is that the testimony relating to "deep penetration" causing "an up in the center circulation . . ." and "refractory wear on the walls near the bath surface" is contained

at (PX-J-19 pp. 6146-6156) (PX-349) whereas the testimony of "deep penetration [causing] bottom damage to the refractory as the result of a downward moving stream of hot metal in the center of the bath" is **[272]** recorded at (PX-J-36 pp. 12,340-12,343 and PX-J-37 p. 12,363). In examining these two different portions of the McLouth transcript, we find that in the first instance Dr. Elliott was explaining the chemically induced circulation which resulted by following the instructions contained in the Suess patent specfication and the advantages of such a circulation as promised by the Suess patent from chemical reactions. This was explained as opposed to the mechanical circulation produced by deep penetration of the oxygen jet into the bath as in the case of the prior art, and its effect, not only upon the chemical process as prescribed by Suess, but also as damage to the refractories.

In this part of the testimony Dr. Elliott explained that chemical functioning of the Suess patent eliminated the need for the stirring action produced by the deep penetration of the prior art; that there was a substitution of such stirring action by a chemically produced circulation initiated at the top central surface of the bath, as instructed by the Suess patent specification. He further explained how the prior art of deep penetration produced an unwanted mechanical action in the bath and refractory damage.

[273] In Suess' instructions the circulation was chemically downward and proceeded as the patentees had believed it would and, at the same time, protected both the bottom refractory and the sidewall refractory. Whereas, in the prior art, mechanical circulation forced the circulation upward in the center and outward to the sides. In the latter practice the hot upward and outward flowing metal was forced to make more direct contact with the refractory during its downward flow and as it flowed inwardly at the bottom of the vessel.

Dr. Elliott explained that in the Suess prescriptions the hot metal had a circulatory movement along the bottom and sides as well as at the top which provided it with a cooling effect. Whereas in the case of the mechanical action of the jet with its flow upward in the center, there was no accommodation for cooling, and as the metal came in contact with the bottom and side refractories, they eroded or were damaged. At this point Dr. Elliott's testimony had nothing at all to do with the Ann Arbor Demonstration No. 9, but only with the Suess patent specification instructions and disobedience to such instructions in what would be an ordinarily comprised molten metal bath as prescribed for industrial use.

[274] This, however, is only a part of my inquiry and study which shows that paradoxically ". . . . circulation [can] be both up and down in the center at the same time" in a molten metal bath which is activated by an oxygen blow; but more especially where it is carried by a centrally and vertically placed oxygen jet directed to the surface of the molten metal bath.

On the basis of one of its defenses that circulation in the center was always upward in the bath, McLouth produced several expert witnesses. Particularly, it presented the testimony of Dr. Robert D. Pehlke, an Associate Professor of Metallurgical Engineering of the University of Michigan, (PX-J-38, pp. 13,051-13,059), who testified that he observed such a circulation. In any event we have no argument from McLouth that there is an up in the center movement in the molten metal bath as the jet impinges. The plaintiffs say that when the jet is placed low in the bath, as practiced by the prior art of Schwarz and Miles, the result is a mechanical motion or movement upward in the center. Thus, there is then no disagreement from either the plaintiffs or defendant on this point. The main contention lies with what happens when the oxygen jet is placed at the top center of the bath in accordance with the prescription of Suess.

[275] I mention here first of all that the Suess patent specification asserts that the oxygen reacts first with the iron, then the silicon and manganese, and within the first minute develops extremely high temperatures in the zone of direct oxygen contact (col. 4 beginning with line 43); and that there was a more than one-way movement of the newly formed iron oxide with "A portion of the iron oxide goes to the slag . . . and a portion diffuses into the bath" (col. 4, lines 54-56). Thus we know that iron oxide is first of all forced upward and outward into the slag, as well as downward into the bath. Here we already see the first phenomenon of both up and down movement in the bath. Dr. Chipman described this phenomenon in detail (PX-J-2, p. 384) and said:

> "Sometimes I think there is quite a large amount of metal included in these bits and pieces and blobs which are thrown out of the furnace. The throw-out here is due to chemical reactions existing in this highly heated zone."

He then followed with this (PX-J-2 p. 385):

> "Now, other things show up as a consequence of the chemical reactions. One of these, and a very important one, is a downward central blow of metal immediately under the highly heated surface area."

Dr. Shapiro corroborated this when he said (PX-J-12 p. 3180) **[276]** that an explosive occurrence in a liquid bath would cause exerted forces in all directions, but mainly vertically. It was here that Dr. Shapiro attempted to corroborate his statements by various demonstrations, one of which the Opinion spoke of as an "explosive bubble" mechanism but which the District Court discredited because it "was admittedly not contained in any literature prior to the time of trial." (257 F.Supp. at page 438). Dr. Shapiro submitted to the *McLouth* District Court a series of demonstrations which involved a significant number of explosive squibs and oxy-acetylene ignitions in water

baths, but none of these are mentioned in the District Court Opinion.

Here, I refer to the undisputed testimony of Dr. Shapiro when he said (PX-J-13 pp. 4077-4079) that an explosive occurrence in a liquid bath would cause exerted forces in all directions, but mainly upward and downward.

> "A. The jet does or can spatter up some liquid. I am referring now to liquid which is thrown up by the explosive mechanism.
>
> Q. Well, can you identify any liquid which is thrown up by the explosive mechanism in an oxygen converter?
>
> A. Yes, sir, I can distinguish between the two . . .

[277] Q. (By Mr. Groner) How can you identify it from that which might be thrown up by the mechanical force of the jet?

A. I can mention three which come to my mind, three situations which show that the upthrown liquid is due to explosions and not to the mechanical action of the jet.

In the McLouth operation as well as in the Fontana operations, as well as in other L-D operations that I have been told about— . . . The violent throw-up activity which persists through most of the heat dies down and is not present at the end of the heat.

Now, it is my understanding that in the McLouth operation, the lance distance is lower near the end of the heat. If the throw-up were due to the jet spatter, then I would expect at the end of the heat more throw-up. But the violent throw-up disappears . . .

The second point I would make refers to the Linz rudder tests and the associated films which Mr. Wallner showed. There was a great deal of throw-up in those tests.

I would mention first the throw-up was of the irregular character involving large hunks and globs of metal which, from experiment, I have seen arises from explosions and not from jet spatter. . . .

The Linz rudder experiments, if one puts together the observations on the throw-up and the observations on the rudders themselves as to the fact that there is downward circulation in the center, leads to the conclusions that there must have been explosions present. If there were no explosions present, there would be no way of accounting for the direction of **[278]** the observed circulation. If the throw-up seen there were primarily due to the mechanical action of the jet, the circulation would have been opposite to the circulation shown by the rudders.

I might mention furthermore in support of my statement regarding the source of the throw-up the experiments described by Dr. Chipman, in which he blew on pig iron, on carbon-bearing iron, and on iron free of carbon with different gases. He showed that when there were no chemical reactions occurring in the melt between oxygen and carbon, if there was any spatter at all, it was an extremely small amount compared with the violent throw-up that occurs when there is a reaction between oxygen and carbon in the melt."

While Dr. Shapiro was showing a movie of multiple-squib explosions (PX-J-12 p. 3615) he stated:

"The air above the vessel is, one might say, literally filled during the entire interval with liquid which has been thrown up. . . .

Each explosive bubble drives vertically downwards carrying liquid with it. At the same time, each explosive bubble sends vertically upward large amount of liquid water which proceeds above the free surface. The gas bubbles moving downward drag liquid with them. The down-moving column of liquid, when it reaches the bottom, moves outward radially along the bottom of the vessel . . ."

Referring to films of demonstrations at Wayne University, Dr. Shapiro was asked his observations, and he replied (PX-J-12 p. 3635):

[279] "We have just witnessed the experiment from a gallery seat more or less above the vessel. My observation was that the up-thrown liquid came substantially from the central region of the bath."

When asked about his conclusions, he stated (PX-J-12 p. 3637):

". . . The third conclusion is that concurrently with these events below the surface which arise from the explosions, there is a large amount of liquid thrown-up above the surface. That liquid throw-up above the surface is characterized by its generally vertical direction and by the fact that it is unsteady and irregular, appearing in the form of larger and smaller pieces and slugs of fluid of various shapes."

And further he said (PX-J-12 pp. 3648-3649):

". . . One sees here the electrodes in the bath, with bubbles rising and occasional explosions of those bubbles. The exploring bubbles drive downward, and one can see in the bath a toroidal circulation, which is downward in the center and upward at the walls. One can also see that each time there is an explosion, there is an extremely large amount of throw-up above the explosion area in a generall vertical direction."

Dr. Shapiro described the thrown-up material he had seen in McLouth's actual operations and the water demonstration he had performed with explosive squibs and exploding oxy-acetylene gas showed that explosions will cause the type of throw-up he observed at McLouth's plant, and stated at (PX-J-12 p. 3701):

". . . The direction of the material being thrown up showed that the material came from the central region of the bath. This means that the material **[280]** had to move upward against the action of the jet. It had to pass countercurrent through the jet itself and manage to find its way out through this very small opening.

In my opinion, nothing could account for this except for explosions in the central part of the vessel which ejected material vertically upward at very high speed."

Another series of tests was presented before me and I have recorded the demonstrative activity which resulted, as well as their evidentiary values. These are referred to in the portion of the *J & L* Opinion concerning Infringement. From my observation of these demonstrations presented before me by Dr. Kemper, I have not the slightest doubt that such an ignition in visible water baths definitely confirms both an upward and downward movement in the bath at the same time.

This action-reaction is familiar, when water suddenly and forcefully leaves a nozzle of a hose, and a backward reaction is felt by the one holding the hose. The oxidation process as oxygen makes contact with the molten metal at the surface is explosive. Thus, the theory when explained by Dr. Chipman takes on meaning. It is more particularly significant as follows (PX-J-4 pp. 980-981):

> "Q. Now again getting to this assertedly explosive movement which drives the metal and the CO bubbles downwardly, why or what **[281]** is the basis of your theory that the explosions drive downwardly rather than some other direction, Doctor?
>
> A. The metal which is thrown out is generally upwardly. At some plane, certainly above the horizontal, and much of it goes quite high. For each action there is an equal and opposite reaction, so that opposing and upward component of throw-out there is an equal and opposite action downwardly which must be expected and looked for.
>
> Q. There also is an action in every other possible direction, isn't there, Doctor?
>
> A. Each always balanced by an equal and opposite action.
>
> Q. Then if you have equal and opposite actions in all directions, how do you have a downward flow, Doctor?
>
> A. To compensate for the upward throw-out."

It is not difficult to understand that the explosive force in the liquid bath is no different from the explosive recoil which is occasioned by firing a bullet in a gun. This principle of action and reaction is explained by Newton's Third Law of Motion that for every action there is an equal and opposite reaction. Therefore, action and reaction in the bath triggered by the explosion would be equal and opposite.

Thus as relates to Dr. Elliott's earlier testimony explaining the chemical action and reaction in the bath, as it **[282]** would be exeplified by surface contact and explosions and by the mechanical deeper oxidation forces with their reactions, there is considerable scientific authority to corroborate him. And as his testimony relates to Demonstration No. 9, and we examine the conditions under which Demonstration No. 9 was made, we quickly become aware of the fact that in the shallow bath of 6.8 inches, the capability of introducing 58 times as much oxygen into the bath to 22% of its depth might indeed be close enough to the bottom to bring the high temperatures, which the oxidation-reaction created, in direct contact with the refractory and damage it. Nevertheless, Dr. Elliott's testimony, it would seem, does not present a basis for disbelief primarily because (1) the District Court Opinion does not set forth any contradictory evidence by any of the experts, but especially those of the defendant, and (2) because the record otherwise fails to disclose that where deep penetration occurs, that the sidewalls at the interface are not damaged. Dr. Elliott clearly set forth this fundamental misunderstanding in his testimony here. See CE pp. 234-295. It is plain from this, that a patent does not depend upon the necessity of the applicants knowing the scientific "how and why" of the working of their patent. An applicant is only required to produce a **[283]** working patent. My discussion of the scientific principles and theories involved, as they were developed and presented only for the purpose of ascertaining whether or not there was any misconception of the scientific values,

or any misinterpretation of expert testimony, which may have unjustly formed the basis of the final determination, and if so to report it. We have observed here that although there was a heavy burden upon those who sought to discredit the patent or to show that any one of its ingredients as claimed by the patentees was either unnecesary or an injurious part of the whole patent, *Martin* v. *Sears,* 317 F. Supp. 1089 (D.C.Tex. 1970); *Phillips* v. *Thermal,* 311 F. Supp. 17 (D.C.N.J. 1970), failure or success of the defendant in the case to meet that burden would become a critical part of these cases before me. The defendant has failed to do so, and I conclude that the combustion process of oxygen with the oxidizable materials in the molten iron bath when so injected can produce (1) movement of the molten iron bath upward and outward against the interface between the slag and the surface of the bath and potentially damage the sidewalls; (2) can move downwardly at the same time and potentially damage the bottom refractory; and (3) that circulation *can* "be both up and down in the center at the same time."

But whatever the direction of circulation is in actual practice, I must re-emphasize that the patentees are not **[284]** required to understand every scientific principle or reason for the success of their method; *Eames* v. *Andrews,* 122 U.S. 40, 56 (1886). Indeed, as previously stated, it would be remarkable if anyone could so understand the complexities of the patent in suit.

[285] **XV. Prior Art Changes—From Linz Tests**

In pointing out what they considered the various inconsistencies of the District Court Opinion, the plaintiffs referred to the comment made by the Court (257 F.Supp. at page 440) that:

> "It would seem, therefore, that the distinction between the claims of the patent in suit and the prior art practice may well be a purely verbal one. In this connection, it must be noted that plaintiffs had considerable opportunity, both before and during the trial of this suit, to conduct steelmaking experiments that would illustrate a distinction, if any between the process as claimed in the patent in suit and the practice of steelmaking under the Schwarz and Miles teachings of deep penetration. However, plaintiffs admittedly failed to come forward with evidence of any such experiments."

The plaintiffs here assert that the District Court "overlooked its earlier discussion of the June, 1949 tests (pp. 410-15) which, as the Court pointed out, demonstrated that the patentees' process was a different and more successful process than had been practiced or disclosed by Dr. Durrer and Dr. Hellbruegge, whose practices were the same as Schwarz and Miles and involved the deep blowing of both Schwarz and Miles." (Statement for Plaintiffs on the Issue of Collateral Estoppel, at page 48).

Not only was this true, but the plaintiffs here did not point out the fact that the *McLouth* District Court misinterpreted the testimony of witnesses relating to the June 1949 Linz tests, by attributing statements made in this testimony to the Suess patent itself, when in fact such testimony did not even mention the Suess patent.

[286] The District Court Opinion discussed the tests conducted by the applicants during June 1949 at Linz, Austria, and attributed "the new concept, the new mental approach" to the testimony of Drs. Suess, Rinesch, Trenkler and Hauttmann, the inventors, (R. 13,184-13,187) (257 F.Supp. at page 410), and further, projected this to "the concept of a reduced impact pressure of the jet on the bath so as to avoid deep penetration" (257 F.Supp. at pages 410-419). Starting with the first, the District Court Opinion stated, "Indeed, Dr. Trenkler testified (R. 11,905) that the avoidance of deep blowing in the process at Linz was the only difference from the process of deep blowing at Gerlafingen." (257 F.Supp. at page 410). At another time the District Court Opinion said, "In like manner, Dr. Hauttmann testified that the

only changes in operating procedure made by the patentees from the June 17th tests following Dr. Durrer's teachings to the June 25th tests following the patentees' own ideas, were the change from the Laval nozzle to a normal cylindrical nozzle and an increase in the nozzle bath distance from 10 centimeters to 15 centimeters (R.2665,2246,2256)." (257 F.Supp. at page 410).

This statement in the Opinion, as I have researched it, is accurate, but only so far as it goes. By itself the statement would seem to be non-critical, but when this was associated with the inventors' "method" and with a follow-up excerpt of similar admissions at the final argument, it became critical, because by these observations the District Court seemed to be laying the **[287]** foundation for its eventual finding that "avoidance of deep penetration was the gist if the invention." Thus the plaintiffs' contention that both *McLouth* Courts failed "to grasp the technical aspects of the case and the real issues involved," might well have some partial foundation in the misconception and misinterpretation that the only differences between the prior art and the *patent* (and not the June 25th Linz tests) was in "the change from the Laval nozzle to a normal cylindrical nozzle and an increase to the nozzle bath distance from 10 centimeters to 15 centimeters." The follow-up excerpt from the District Court Opinion reads as follows:

> "*Plaintiffs also admitted on final arguments* that the only mechanical changes in method from the teaching and disclosures of Dr. Durrer and Dr. Hellbruegge were the change from a Laval to a normal nozzle and an increase in the nozzle bath distance. (R. 13,183-13,-187)." (Emphasis added) (257 F.Supp. at page 410).

This statement is taken out of context.

While there were statements made by counsel for the plaintiffs by which, in their isolation, such a conclusion or such conclusions could be drawn, an examination of that portion of the final argument dealing with this phase, on

the whole, presents a truer picture. But I shall first point out that this segment of the testimony from which these various excerpts were taken dealt with the exprimentation of Dr. Durrer and Dr. Hellbruegge at Gerlafingen, Switzerland, and of what the **[288]** difference was between the Swiss experiments and the Linz experiments during June 1949, as related to two (actually three) different kinds of tests.

This test was started with a blowing pressure of 7 atu at 15 centimeters distance from the bath. However, because a heavy discharge occurred during decarbonization, the oxygen pressure was reduced to 4 atu. Other difficulties arose but most particularly a turbulent boiling motion occurred which produced foam. As a result of this the experimenters conducted test No. 4 with an attempt to eliminate the difficulties which had resulted in test No. 3. In test No. 4 they raised the pressure to 8 atu and reduced the distance of the nozzle from the bath to 10 centimeters (PX-K-12-B p. 1527b- M DX 26-B). However, from the results obtained from the third test on June 9th, the experimenters conceived the idea that greater nozzle to bath distance and lower pressure and flow rate were called for (PX-J-7 pp. 2231-32).

In the meantime a series of four tests, Nos. 5-8 were conducted. With what they had learned, particularly from the June 9th tests, they planned a two-series experimentation, one based upon the old concept of deep penetration, and the second, in accordance with the new concept of increased nozzle to bath distance and lower pressure and flow rate.

Although they started to carry out a series of tests, Nos. 15-19 on June 22nd, in accordance with what they conceived **[289]** to be the new concept, these apparently failed because of badly damaged refractory linings, and so these were stopped. The refractories were renewed and the "new concept" was tried out on June 25th, 26th and 27th, with four tests on the 25th, Nos. 20-23; four on the 6th, Nos. 24-27; and

three on the 27th, Nos. 28-30. (PX-K-12B p. 1581b - M DX-116).

While the tests carried out on June 25th, 26th and 27th demonstrated that satisfactory results could be obtained (PX-J-8 pp. 2249-50; J-35 pp. 11,899-904), it will be observed only in tests Nos. 2 and 3 and in tests Nos. 20-30 inclusive on June 25th, 26th and 27th was satisfactory steel produced. Yet, in none of these was there any claim that the steel was of a quality equal to that produced in the open-hearth.

In any event, as I said before, when Dr. Hauttmann and Dr. Trenkler testified to the differences between the prior art and of that experimentation which had been carried on at Gerlafingen, the statement was that the only difference was from a Laval to a regular nozzle and by increasing the nozzle-bath distance from 8-10 centimeters to 15 centimeters.

In examining all of the testimony here, it is noticeable that other distinctions were incorporated in the evidence, as these became eventually a part of the specification teachings in the patent applications filed in the United States Patent Office. **[290]** These were different from the prior art of Schwarz and Miles who relied on a more or less horizontal nozzle entering the bath; the Gerlafingen experimenters relied upon a bent lance, but the Linz experimenters through the June 27th tests designed and used a straight water-cooled lance entering through the top opening (PX-J-7 pp. 2225-28; J-35 pp. 11861-62; J-36 pp. 11932-33).[46] The nozzle was inserted from the top center and as the vessel was straightened, it was approximately vertical and approximately centrally injected (PX-J-7 p. 2225, PX-K-12-B p. 1530b M DX-26B). Also, the difference in pressure was not noticeably observed at this time and after the June 27th tests, both the difference of nozzle use as well as height

[46] Laval nozzle on June 17th only and changed to cylindrical nozzle on June 25th, 1959 (PX-J-7 p. 2246). (PX-K-12-B p. 1581b-M DX-116 shows normal nozzle used from June 22nd on.

from the bath were disregarded by the experimenters in their remaining tests, which included a total of approximately 250 by the end of November 1950. By reason of all of these tests up to November 1950, neither differences as they were emphasized as differences between the prior art and the experimentations carried on through June 27th bore any materiality or relevance with the specifications prescribed in the patent applications as they were presented to the United States Patent Office.

[291] The testimony of Dr. Rinesch, Dr. Trenkler and Dr. Hauttmann came to the *McLouth* District Court by way of interpreters and on occasion misunderstanding and misinterpretations became obvious. However, one fact is clear. On one of the occasions when clarification was necessary, Dr. Hauttmann did make an out-and-out assertion which was evidently lost to the recollection of the District Court. That statement was (PX-J-9 p. 2658), "I was talking about the tests rather than about the distinction between the patent and the prior art." This is important, because while the District Court attributed statements to Dr. Hauttmann and Dr. Trenkler to the effect that the only differences between the prior art and the experiments of June 25th at Linz were in the change of a regular nozzle to a Laval nozzle and of increasing the distance from 10 centimeters to 15 centimeters, it is obvious that Dr. Hauttmann did inform the District Court that he "was talking about the tests rather than about the distinction between the patent and the prior art."

From all of this it is evident that the District Court attempted to extrapolate from the testimony, particularly the testimony of Drs. Trenkler and Hauttmann, the differences between the Gerlafingen experiments and the June 17th and June 25th 1959 Linz tests, and the patent itself. Dr. Hauttmann **[292]** made it plain that in his testimony he was talking about the differences in the two series of tests and not between the patent and the prior art. The

question now is whether or not the District Court extrapolated this difference from the June 17th and June 25th tests to the findings that the invention lay in the reduction of impact pressure by the jet on the molten metal bath.

However, in connection with the testimony of Dr. Hauttmann, particularly I should point out two possible misconceptions which may have occurred on what might both be technical and legal bases. When Dr. Hauttmann was asked whether the nozzle should be a Laval type or normal or cylindrical type, he answered (PX-J-9 p. 2754): "Any type can be used." And the District Court (PX-J-9 p. 2565) asked Dr. Hauttmann whether there were any other departures from the prior art with respect to the patent in suit other than the two talked about, and the answer was "Yes . . . That is the production of a hot reaction field in the middle of the upper bath region." The District Court interrupted "Wait a minute now. We are not talking about the results obtained, but we are talking about the methods used. That is what my question is directed to." And the witness replied, "That is the non-deep penetration of the bath." Counsel for the defendant suggested "That still is the result, if it please, your Honor." The Court replied "Well, it may be. . . ." (PX-J-9 pp. 2656-57).

[293] That brings us to the interesting and critical question of whether "avoidance of deep penetration" is in reality a method as required by the statute or the result of the method. Since we deal here with a process, we may conclude that that process is "operative" if it produces its intended results. *Application of Ruskin,* 345 F.2d 395, C.C.P.A. 1966. The result the patent is intended to produce is not "avoidance of deep penetration" but rather a successful refining of molten iron into steel by means of applying high purity oxygen onto the surface of the molten metal bath (col. 12, lines 10-16 and col. 2, lines 36-44). A patent does not issue when it is based on results alone. *In re Lamnchen,* 112 F.2d 817, C.C.P.A. 1940. Thus if "avoidance of deep penetration" is a result, it is not patentable. It is the distinctive means or method for accomplishing results which is patentable. *Mervin Glass & Associates* v. *Sears, Roebuck & Co.,* 318 F.Supp. 1018 (D.C. Tex., 1970) *aff'd.* in part 448 F.2d 60, C.A. 5, 1971. The law is clear that there is no patent on result. A patent is awarded for the distinctive means or method of accomplishing the result. *Jenkins Metal Shops, Inc.* v. *Pneumafil Corp.,* 303 F. Supp. 653 (D.C.N.C., 1969), *aff'd.* 427 F.2d 144, C.A. 4, 1970. The law is well settled that the end or purpose sought to be accomplished by the device is not the subject of the patent. The invention **[294]** covered thereby must consist of new and useful means of obtaining that end. *Knapp* v. *Morass,* 150 U.S. 221 227 (1893).

Is the adjustment of a nozzle or changing its character so as to produce a lesser impact pressure of the oxygen upon the metal bath, a cause and is the lesser impact pressure thereby produced, a result? And if a lesser impact pressure produces avoidance of deep penetration, is lessening of impract pressure the gist of such an action, or is its productive result, avoidance of deep penetration, the gist of the action? If the lesser impact pressure does not damage the bottom refractory because the oxygen is not blown deeply enough, is the avoidance of deep penetration a cause and the avoidance of injury to the bottom refractory a result? If the lessening of the impact pressure permits more iron oxide to enter into the slag to refine the sulfur and phosphorus, is that the gist of the invention, or is avoidance of deep penetration the gist of the invention? Or are all of these mutually correlated steps for producing the ultimate result of obtaining steel by the use of the oxygen application?

Carrying this thinking still further, are these heretofore mentioned steps the total component parts of producing the results of obtaining steel from iron by the application of oxygen? **[295]** Or are there others, and if there are others, what are they? If there are other steps or mutual,

correlated ingredients are they not altogether to be considered as the "method" concerning which the patent statute speaks? Under such circumstances, all of these together in combination would be the cause of the ultimate result of obtaining steel from iron by the use of oxygen.

Because all of this, in the way of intermediate results, seems to be interconnected with the District Court's extrapolation of the two differences in mechanical application from the June 17th tests to the June 25th tests and the final patent, it is appropriate at this time to discuss the District Court's finding that "however, the patentees must be credited with the invention under applicable patent law, because they took the final step of reducing impact pressure so as to avoid refractory damage and to create the early fluid slag necessary for satisfactory phosphorus removal. . . . Yet this final step of reducing impact pressure was the difference between success and failure." (257 F.Supp. at page 419). Thus it would seem that the "final step" was considered by the District Court to be in effect the invention. Under these circumstances, then, the June 25th series of experiments by Suess at Linz finalized the invention, and it would further seem that the balance of 250 tests which ran up until November, 1950 contributed nothing more to the **[296]** invention—or to the patent. However, there is one serious difficulty with this thinking, and that is that the patent as granted in 1956 by the United States Patent Office does not recognize the invention to be "a reduction in impact pressure" (257 F.Supp. at page 425).

There was considerable confusion in the questions asked of both Drs. Hauttmann and Trenkler, but particularly Dr. Trenkler, and oftentimes inferences were ambiguously contained in both the questions and answers. These witnesses were hard to follow, particularly as they indicated that there were different nuances for words in German which did not exist in English. My inquiry was in attempting to resolve the plaintiffs' various contentions

that the District Court failed to grasp the technical facts or misconceived and mis-interpreted the testimony. This is perhaps exemplified in a portion of the questions and answers comprising the testimony of Dr. Trenkler. It begins with the question on cross-examination (PX-J-35 p. 11,899):

> "(By Mr. Groner, continuing) . . . In your work in Linz in the summer of 1949, when was the first time, according to your theory, when you did something that differed from what Dr. Durrer and Dr. Hellbruegge had taught you?"

Here we see a specific question pointed to the June 1949 tests, and yet as these questions and answers meander through at least the next seven pages, they refer to what might seemingly be **[297]** ambiguous references to the Suess et al. patent specification itself, but from a close examination of all of these it is obvious that the witness was speaking about the difference in their June 1949 tests from that of the prior art, but particularly of that practiced by Durrer and Hellbruegge at Gerlafingen. It is significant that the District Court was formulating conceptions based on cause and effect in line with applicable legal principles all on the prior art, and what would amount to the completed patent specification as exemplified in the June 25th, 26th and 27th, 1949 tests. Throughout all of this the District Court was searching for method, as it properly should, rather than for what the method produced. And when the witness answered, "There are no other differences," the District Court had apparently arrived at the conclusion that Dr. Trenkler spoke of the Suess et al. patent, and this in spite of the fact that the Suess patent specification as filed in the United States Patent Office was never mentioned.

My inquiry led me into a question of whether or not the defendant's counsel, throughout the trial in his cross-examination of the plaintiffs' experts, did or did not provide

grounds for misleading the District Court on the technical facts and issues as they occurred. Mr. Groner, counsel for the defendant, was a highly skilled, and most especially persistent cross-examiner. This at times created a state of confusion of the facts themselves.

[298] In spite of the high skill of the plaintiffs' Massachusetts Insitute of Technology experts, I have observed frequently their submission to the cross-examination rather than to an out-and-out declaration of the scientific facts. With interpreters as intermediaries between the German witnesses, Dr. Trenkler and Dr. Hauttmann, it at times became difficult for clarification of Mr. Groner's cross-examination as it related to the two differences between the June 17th Linz tests (and Gerlafingen experimentation) and the June 25th Linz tests (referred to as the "new concept"), I observed the efforts of the cross-examiner to tie in this difference with the present day practice of the Suess "method" and this I observed to be a skillful maneuver on the part of the cross-examiner to tie this in with the McLouth defense that at McLouth the prior art of Schwarz, Miles and Gerlafingen were practiced in their OP-1 and OP-2 operations.

There were objections on the part of the plaintiffs' counsel but somehow or other the information elicited by cross-examination found its way into the evidence. As for instance, Dr. Trenkler in direct testimony testified only to the visit which he made to Gerlafingen, Switzerland and the contact he made with Dr. Durrer and Dr. Hellbruegge at a May 1949 meeting.

[299] Mr. Groner asked (PX-J-35 p. 11,881) about two tests at Linz on May 9th. Mr. Webb objected to this as going beyond the scope of direct examination because no questions were asked of the witness regarding the Suess Linz tests in June 1949. A long debate occurred on the question. At one time Mr. Groner said (PX-J-35 p. 11,884):

> "I will show your Honor, if I am allowed to, that they —when I say 'they' I mean Dr. Trenkler and his associates at Linz—equated the teaching of Dr. Durrer and Dr. Hellbruegge on the one hand with that of the German Schwarz patent on the other, and, further, that they thought for a long time that they were operating under the Schwarz patent."

The objection of Mr. Webb was further emphasized and argued (PX-J-35 p. 11,886). In the end, however, the Court allowed the question to be asked and answered as it related to the two tests held in June 1949 at Linz. However, when the cross examiner asked (PX-J-35 pp. 11,893-94):

> "Those two tests of June 9 which you say were successful were run according to the teachings of Drs. Durrer and Hellbruegge, weren't they, Dr. Trenkler?,"

Dr. Trenkler's answer was:

> "No, not quite."

He then explained further (PX-J-35 p. 11,894)

> "First, test No. 4 had an essentially smaller oxygen impact pressure, that is, an oxygen pressure and a higher nozzle-bath distance, and this is shown in my report dated June 10 in the fourth paragraph, and in the fourth test, as I see only now, a normal nozzle and not a Laval nozzle was used."

[300] And further, (PX-J-35 p. 11,894)

> "Q. Did Dr. Durrer or Dr. Hellbruegge teach you that you had to use a particular oxygen pressure and nothing else?
>
> A. I believe I have already explained exactly the teaching of Dr. Durrer and Dr. Hellbruegge, and I am going to do it once more.
>
> Q. Thank you, Doctor.

A. Their opinion and their teaching is that the oxygen jet has to penetrate into the lower regions of the bath so that a corresponding bath movement by the oxygen stream will be insured and a low iron content of the slag can be obtained.

Q. Now, Doctor, I am going to ask you my question over again. Did Dr. Durrer and Dr. Hellbruegge tell you that you had to use a single particular kind of oxygen pressure and no other kind?

A. No."

With the door thus opened the cross-examination led into information which indicated that a regular nozzle was first used in Test No. 3 and that a Laval nozzle was used in Test No. 4, on June 9th. Also the testimony indicates that a 15 centimeter height from the bath depth was used on June 9th rather than on June 25th. This, of course, creates a certain amount of confusion between whether or not the two differences actually occurred between June 17th series of tests and the June 25th series of tests, since Dr. Trenkler testified that the change first occurred on June 9th with Test No. 3.

[301] However, it was also indicated that on the basis of the difference of the tests in Test Nos. 3 and 4 on June 9th, a plan for future testing was eventually devised. What is significant here is that a misconception or misinterpretation occurred by which the District Court was led into accepting the real difference from the prior art of Schwarz, Miles and Gerlafingen, and the Suess Patent process lay in the discovery by the Suess experimenters at Linz that the only two differences from Gerlafingen and the patent itself or the method in the patent itself, was in the change of the nozzle and its height from the surface of the bath. Was this or was this not the basis by which the McLouth District Court arrived at its finding,

"Further, plaintiffs in this litigation have repeatedly contended that the 'new mental concept' that differentiates the invention of the patentees from the prior art Schwarz and Miles patents, and also the teachings of Dr. Durrer and Dr. Hellbruegge, was a reduction in impact pressure so as to avoid the deep penetration suggested by the prior teachings." (257 F.Supp. at page 425).

And it further found,

". . . this final step of reducing impact pressure was the difference between success and failure." (257 F. Supp. at page 419)

And,

"However, the patentees must be credited with the invention under applicable law, because they took the final step of reducing impact pressure . . ." (257 F. Supp. at page 419).

[302] And,

". . . all four of the patentees at one time or another considered a reduced impact pressure of the jet on the bath or the avoidance of a deep penetration of the bath by the jet to be the gist of the invention." (257 F.Supp. at page 424).

Thus it is that the District Court did not correlate and differentiate the method of the June 1949 Suess experimentation, but rather correlated the Suess patent specification and the Gerlafingen experiments and arrived at the conclusion that the only difference was one of "lower impact pressure" (257 F.Supp. at page 425).

That the District Court correlated these two changes in the early experimentation by the Austrians, and the eventual invention and patent itself, is borne out by various parts of the District Court's Opinion. When discussing the achievements of Dr. Durrer and Dr. Hellbruegge at Gerlafingen and the assertion that the plaintiffs contended that they did not get a disclosure from Gerlafingen of "the

concept of a reduced impact pressure of the jet on the bath so as to avoid deep penetration," the Court concluded that according to the plaintiffs, "avoidance of deep penetration" is "the new concept, the new mental approach of the patentees." It also concluded that "Whether such a reduction in penetration by the patentees should be considered significant *for patent purposes* could only be determined by a comparison of the actual results achieved by the tests at **[303]** Gerlafingen and Linz." (Emphasis added). (257 F.Supp. at page 410).

The Court thereafter discussed the quality of production at Gerlafingen and compared this with the so-called "better quality" of production in the Linz June 25th tests, and found,

> "The striking disparities in the results of these three series of tests [at Linz] appears to this Court to be attributable solely to differences of impact pressures caused by the variation in the type of nozzle used or nozzle bath distance, or both." (257 F.Supp. at pages 411-412).

The Opinion also states that,

> "This difference in result is apparently explained by a different order of chemical reaction, when deep penetration was avoided." (257 F.Supp. at page 414).

The Opinion continues with the statement that Dr. Trenkler had achieved "better dephosphorization [which] . . . indicates strongly an entirely different steelmaking process taking place in the Linz June 25th series of tests than at Gerlafingen, despite a seemingly minor change in the operating procedures." (257 F.Supp. at page 414). The Opinion says,

> ". . . the June 25th tests at Linz represented a different and more successful process than had been practiced and disclosed by Dr. Durrer and Dr. Hellbruegge . . . involving a relatively low impact pressure of the jet on the bath as opposed to the recommendation of Dr. Durrer and Dr. Hellbruegge . . ." (257 F.Supp. at page 415)

In the conclusion the Opinion states,

> **[304]** "In the opinion of this Court, a preponderance of the evidence establishes that the patentees rather than Dr. Durrer and Dr. Hellbruegge were, in fact, the true inventors of the subject matter of the patent in suit." (257 F.Supp. at page 418).

Such Opinion excerpts reveal two facts: first, that the District Court confined its considerations only to the change of nozzle and change of nozzle height in the Linz June 25th series of tests; and second, that it based its finding that the Suess process (as revealed in the Linz June tests) was based on these two changes in the June 25th tests.

From the testimony of Dr. Hauttmann and Dr. Trenkler it would seem that no foundational support was laid for the findings that "lowering of impact pressure" was the invention, because of avoiding deep penetration which was the "gist of the invention."

In a third reference (PX-J-39 pp. 13,184-87) (257 F. Supp. at page 410), that the "Plaintiffs also admitted on final arguments that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge were the change from a Laval to a normal nozzle and an increase in the nozzle bath distance." Since we are still on the question of whether or not "lowering of impact pressure" is the one concept of the Suess invention, and as such "the gist of the invention" because it results in the "avoidance of deep penetration," I am bound to pursue my inquiry into the third point discussed in the District Court Opinion on this related topic.

[305] While Drs. Hauttmann and Trenkler testified that the two main physical or mechanical differences in the early Suess tests at Linz were a change of Laval nozzle

for a regular nozzle and heightening it, there was no support for the District Court's findings that it was the invention for which the patentees made application in the United States Patent Office, and upon which application a patent was eventually granted.

On the other hand such testimony is supportive of the fact that the idea had come to these Linz experimenters that the prior art, including that at Gerlafingen, was not the route by which they should travel in order to get the results which the Gerlafingen experimenters failed to get. And so it was, as the testimony of Drs. Hauttmann and Trenkler showed, that the problem which had not yet been solved in the early Linz tests, required 200 or more tests before it could become an industrial process for the successful conversion of iron into steel.

From my inquiry into all of this testimony, it is obvious to me that the testimony of Drs. Trenkler and Hauttmann was not supportive of the District Court's finding that there were only two mechanical changes from the prior art practiced at Gerlafingen; that such testimony was misinterpreted and misapplied, and that this occurred without any fault on the part of the plaintiffs.

[306] XVI. The Plaintiffs' Final Argument

The District Court Opinion states "Plaintiffs also admitted on final arguments that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge were the change from a Laval to a normal nozzle and an increase in the nozzle bath distance (R. 13,184-13,187.)" (257 F.Supp. at page 410). This statement in the Opinion is highly critical because if true, it reveals an understanding to the District Court's conclusion that reduced impact pressure of the jet upon the bath was the avoidance of deep penetration and so the gist of the invention.

In the final arguement to which the District Court Opinion alludes there was considerable discussion in this regard. The change from the Laval to a normal nozzle and an increase in the nozzle bath distance from 10 centimeters to 15 centimeters was fully discussed in the testimony of Dr. Hauttmann and Dr. Trenkler. As I review the final argument and the colloquies between counsel and the District Court, I find some ground for the conclusion of the District Court, as well as some criticism against the plaintiffs' counsel for his failure to better clarify these particular technicalities. Some specific **[307]** reference to the final argument will exemplify this (PX-J-39 p. 13,186):

> "THE COURT: Yes, but whatever you call it, the only things they actually did, the only mechanical things—put it that way—the only mechanical differences, as I see it, according to their statements, was the change of the nozzle, type of nozzle and the change of the blowing height.
>
> [Counsel for Plaintiffs]: Those are the mechanical things which they did, your Honor.
>
> THE COURT: Is there anything else they did, any other mechanical thing they did?
>
> [Counsel for Plaintiffs]: No, I think that was it, your Honor, so far as the mechanical changes they made are concerned, yes. It was to utilize a nozzle in this work which would give them this *low impact pressure at the surface* . . ." (Emphasis added)

At (PX-J-39 p. 13,189):

> "[Counsel for Plaintiffs]: . . . So what they did, the physical things that they did, was to pull the lance up and also use the normal nozzle for some of their test work. And when they did those two things, they realized then for the first time that this was the way to do it."

Up to here references were entirely to the June 25th series of tests at Linz.

At (PX-J-39 p. 13,208):

> "THE COURT: . . . its your position, . . . that this new concept arose as a result of this accident, and therefore they changed their blowing methods. They used a different nozzle or they changed the **[308]** blowing distance.
>
> [Counsel for Plaintiffs]: Yes."

(PX-J-39 p. 13,225):

> "THE COURT: They taught *deep blowing* and the *Suess* patent here teaches blowing that is not deep.
>
> [Counsel for Plaintiffs]: That's right, your Honor.
>
> THE COURT: That is the main *difference.*
>
> [Counsel for Plaintiffs]: Yes, your Honor. That is the main *difference* . . ." (Emphasis added)

Here we see that the District Court introduced the "Suess patent", where before in the testimony of Dr. Trenkler and Dr. Hauttmann, the "deep blowing" "difference" was in relation to the difference of the June 25th tests from those on June 17th, only as their "new concept" became different from that of the accepted prior art.

If we were to stop here, I would have to agree with the District Court that the testimony of Drs. Trenkler and Hauttmann, as well as plaintiffs' admissions, presented supports for the District Court's eventual holding that the only two changes from the prior art to the patent specification itself lay in the change of a Laval nozzle to a normal nozzle and an increase **[309]** in the nozzle bath distance from 10 centimeters to 15 centimeters.

However, I cannot stop here because of two facts: first, the District Court disregarded many tests which were conducted by the Suess patentees after June 27th, and prior to filing the application; and second, that much of what counsel for the plaintiffs had said and was trying to say

about the patent itself is revealing. We know by looking at the Suess et al. specification that these two so-called changes between the prior art and the June 25th tests were not incorporated in the Suess applications filed in the United States Patent Office. Throughout final argument by plaintiff's counsel, there were many attempts to clarify that point. Counsel's earlier efforts are illustrative (PX-J-39 p. 13,212):

> [Counsel for plaintiffs]: I want to make myself clear on this matter of the new mental concept. I'm not suggesting, your Honor, that we have here a patent on just a mental concept, because what we have is a process patent. We have in the specification description of the process, and we have in the claims a statement of the considerations, the guidelines, the steps that have to be carried out in order to accomplish the results sought by the inventors."

At another time the plaintiffs' counsel (PX-J-39 pp. 13,193-13,194) referred to testimony of Dr. Hauttmann when the question was asked of the witness on what the two changes taught **[310]** regarding the old and the new principles involved, the answer was:

> "'They taught us to think quite differently—completely differently—from the way the others thought who were active in that field. They taught us a different, entirely new concept. They taught us the following in detail:
>
> First, the necessity to avoid a deep penetration of the oxygen jet into the bath. There is no need to produce the bath circulation by the mechanical action of the oxygen jet. The bath movement should not be caused by the mechanical action of the oxygen jet but by the chemical reactions which take place. And third, the desirability of creating a hot spot—that is, a highly reactive zone—in the central portion of the surface of the bath and in the upper region of the bath which is spaced from the refractory lining of the vessel—that is from the walls and from the bottom.'"

In this reference we see two highly critical factors involved. First, blowing into the central portion of the bath, and secondly, at the surface in the upper region of the bath. Counsel for the plaintiffs attempted to impress upon the District Court the fact that (PX-J-39 pp. 13,213, 13,214), the new concept included the physical necessity of the "lowering of the impact pressure of the jet on the metal bath". They at the same time attempted to explain that this one phase of the **[311]** concept not only created an extremely high temperature—localized reaction zone, but it provided that which the prior art did not have, protection against the "burning" of the refractories. At the same time the process eliminated the phosphorus contrary to the results of the prior art.

There was also an attempt to clarify the statement of what the impact pressure meant. For instance plaintiffs' counsel was saying (PX-J-39 pp. 13,215-13,217):

> ". . . I think that there is quite a bit to this mental concept, far beyond this mere matter of just raising the lance, although, as I stated before, there is no question but what that is the thing which the inventors did which caused them to get this new method of blowing, this new concept.
>
> THE COURT: That would be the process then, changing the lance.
>
> [Counsel for plaintiffs]: No, the process is not the changing of the lance. The process is blowing with the low impact pressure or blowing in such a way as to avoid material agitation and so forth *as stated in the patent.*
>
> THE COURT: Getting back to Schwarz and Miles here or Durrer and Hellbruegge, the differences here, as I understood, was simply the blowing, the method of blowing, that could be done either by changing the type of nozzle or increasing the blowing distance, or both. That would be the process, and the other things would result from that, wouldn't they?

[312] "[Counsel for plaintiffs]: No, I don't think so, your Honor.

> THE COURT: It is not enough just to say you are going to blow so to avoid all these things if you don't teach how to do it. You have to teach these steps.
>
> [Counsel for plaintiffs]: *That is what the specification is for, and that is what the specification does.*" (Emphasis added)

Thus we see here an effort on the part of counsel to guide the District Court into the patent specification itself and away from the June 25th series of tests at Linz. If the District Court had differentiated these June 25th tests from what was finally instructed in the specification of the patent as filed in the United States Patent Office, there should have been no misunderstanding.

When counsel for the plaintiffs was questioned concerning defining structural limitations and not merely result, this colloquy occurred (PX-J-39 pp. 13,218-13,219):

> THE COURT: But I was asking you that question in terms of this case, if in fact that is not the situation here, rather than set forth the method.
>
> [Counsel for plaintiffs]: No. I think that the claim sets forth the method, your Honor. And I think that how to do it, within the broad considerations, the broad principles specified in the claim, the specification tells everybody in the art just what to do."

[313] With another of the District Court's questions, counsel seemed again to persist in his contention that the specification of the Suess et al. patent contained the necessary instructions to perform the Suess process. (PX-J-39 p. 13,219):

> THE COURT: Where is that set forth in the specification, that the idea was to control the impact pressure? Does the patent teach that?
>
> [Counsel for plaintiff]: Well I think that—

THE COURT (interposing). In other words, the avoidance of deep penetration was to avoid too much impact pressure?

[Counsel for plaintiffs]: I am not sure that that exact language is employed in the patent, your Honor.

THE COURT: As I understand, that is your claim now, that that is the new concept. The avoidance of excessive impact pressure."

Here was an indication that the District Court was impressed with a synonymity of the terms "avoidance of deep penetration" and avoidance of "to much impact pressure." And when the District Court put the point directly to counsel, it was not clarified as skillfully as counsel was capable of doing. However, he did not fail altogether because he said (PX-J-39 p. 13,220):

[314] "Well, I certainly think that it does teach how to do that, your Honor, because it sets forth examples to be followed and it sets forth exemplary commercial practice, and if you do that you avoid the deep penetration. That is the teaching of the patent."

The Court thereafter asked whether or not it taught how to do it with other sized heats, and plaintiffs' counsel replied (PX-J-39 pp. 13,220-13,221):

"Yes, I think it does. I think the evidence before your Honor is very clear on that point, because we have the testimony first of Dr. Chipman on the point; we have the testimony of Mr. Prince; we have——

THE COURT: (Interposing) I know, but don't you have to find that from the teaching in the specification? Not from the testimony, do you?

[Counsel for plaintiffs]: Well, the question is whether or not the specification teaches those skilled in the art.

THE COURT: That is true.

[Counsel for plaintiffs]: And we have those . . ."

However, eventually the District Court did make a finding that the patent teaching was clearly enough enunciated so as to permit persons skilled in the art of steelmaking to extrapolate the instructions to other size vessels. (257 F.Supp. at page 442)

At another time counsel for the plaintiffs said (PX-J-39 p. 13,223):

[315] ". . . I say here that the mental conception of the method of operation is the important feature, and that that mental conception, which is *reduced to the process steps* which are set forth in the claims, is the thing which resulted is a new mode of operation which has brought about these important and far-reaching consequences." (Emphasis added)

After that there are references by which counsel attempted to emphasize the difference in the prior patents from that of Suess. As for instance (PX-J-39 pp. 13,223-13,224) in the prior art he said the teachings were to use deep penetration of the bath by the oxygen stream for the purpose of stirring the bath. Whereas in Suess, the teaching was to create a localized reaction zone.

When the District Court gave plaintiffs' counsel an excellent opportunity to expound on all the causes or factors which contributed or might have contributed to the stirring of the bath, as in the prior art of Schwarz and Miles, as the plaintiffs' counsel had argued, he obligingly submitted that "deep blowing", as the District Court had limitedly rephrased his term "stirring the bath" was the "primary things". Here in this opportunity afforded him, he might have indicated that angular blowing would have stirred the bath pressure outside the limits instructed in the specification, whether above or **[316]** below the figures and dimensions indicated there; that a non-central blow would have stirred the bath and failure to observe the ratio of bath depth to area surface blowing might have stirred the bath—and so on.

Although we must remember that counsel for the plaintiffs did bring these matters out one factor at a time, he now

added the new factor "the teaching of the localized reaction zone".

With the interchange of these comments relating to deep blowing and other factors, I am at a loss to understand why counsel for the plaintiffs and the District Court were moving in diverse directions. Perhaps counsel for the plaintiffs, in reality, failed to take advantage of these various opportunities to present in graphic language, lucidly and amply, all of these technical factors as a whole. Rather, it appears that he presented the elements narrowly and one step at a time. If plaintiffs' counsel did this it would be most difficult for a trial judge not skilled in the specific art to interconnect the various factors and view them as a single entity.

While I have already excerpted portions of the District Court Opinion showing the conclusions made by the District Court as relates to the term "localized reaction zone" and as such were or might have been related to the work of Schwarz and Miles, [317] we see in what follows that counsel for the plaintiffs was unable to clarify the point for the District Judge (PX-J-39 p. 13,225):

> THE COURT: They taught deep blowing and the Suess patent here teaches blowing that is not deep.
>
> [Counsel for plaintiffs]: That's right, your Honor.
>
> THE COURT: That is the *main difference.*
>
> [Counsel for plaintiffs]: Yes, your Honor. That is the *main difference.* And, as I said before, in the Patent in suit *we go further and point out the necessity for this localized reaction zone* which is not talked about at all or discussed by Schwarz or Miles. I think that that can properly be considered as *another* distinction.
>
> THE COURT: It comes about as the result of *changing* the blowing from deep to something other than deep, doesn't it?" (Emphasis added)

Thus it is apparent that the District Court did not vary in its belief that the scope of the invention was the "avoidance of deep penetration".

The plaintiffs' counsel was again given the opportunity to state whether deep blowing was "the main difference", but he said it was. Here again he failed to explain the full circumstances or factors as they were differentiated in the word "main." However, he did relate this concept to the "localized [318] reaction zone" as a necessity of the Suess process, and further added another distinguishing difference, strict "vertical blowing" which was not anticipated by the Schwarz method, by its permissive angular blowing (PX-J-39 pp. 13,226-13,228):

> "[Counsel for plaintiffs]: Well, it may also come about as a result of the change in the method of blowing. I think that Schwarz's essential teaching is to blow angularly. I think that the essential teaching of Miles is to blow in angularly.
>
> THE COURT: In other words, you are saying another difference is that the blowing is non-vertical?
>
> [Counsel for plaintiffs]: That's right.
>
> THE COURT: Vertical blowing——
>
> [Counsel for plaintiffs]: Vertical as distinguished from non-vertical.
>
> THE COURT: That's another distinction, is it?
>
> [Counsel for plaintiffs]: I think so, your Honor.
>
> THE COURT: Where it fails to anticipate?
>
> [Counsel for plaintiffs]: That's right. There is some suggestion in one of the patents that you can blow vertically, but essentially the two patents teach this matter of the angular blowing as distinguished from the vertical blowing.
>
> THE COURT: Of course, I think it was Miles did teach it could be anywhere from somewhere like 25 degrees to 90 degrees, as I remember it.
>
> [Counsel for plaintiffs]: That is right. That's why I made the statement that I did, your Honor.

[319] THE COURT: But I think it did recommend something between 30-some degrees and 75, or something like that.

[Counsel for Plaintiffs): That is correct."

Counsel for the plaintiffs again attempted to explain the word "stirring" in the prior art as it was to be prevented or avoided in the Suess process (PX-J-39 pp. 13,227-13,228):

> ". . . I mentioned in speaking about the difference between Schwarz and the invention in issue that when you deep blow, you stir the bath with the oxygen stream, and that is, I think the definite teaching of both Schwartz and Miles; and we specifically say in the patent in suit that that's not the way to do it. Don't stir the bath with the oxygen stream itself; stir the bath with the chemical reactions.
>
> Now, while you may feel that that is tied in with this deep blowing, I think that it could very well be considered as a separate and distinct differences between what we have——
>
> THE COURT: Well, now, wait. Even if you get deep blowing, as taught by Schwarz and Miles, will that deep blowing nevertheless stir the thing up the wrong way and all that despite the chemical reaction that would be involved?
>
> [Counsel for Plaintiffs]: I'm afraid I can't answer that question, except to say that these patents tell you you have to stir the bath with the oxygen jet.
>
> THE COURT: I know; but, now, as I remember it, Dr. Shapiro, I think it was or maybe Dr. Chipman, made the point that—I think it was Dr. Shapiro—that the chemical reaction would be hundreds of times more powerful than the jet blow.

[320] Now, even if you get this deep penetration by the jet, wouldn't there also necessarily be the chemical reaction involved along with it?

> [Counsel for plaintiffs]: There would undoubtedly be some chemical reaction, some stirring from the chemical reaction, but what you might have there if you had this real combination of chemical stirring and stirring by the oxygen stream I don't know.
>
> But the teaching that we have here is to utilize the chemical reactions for doing that job as distinguished from what these other people said to do—namely, stir by means of the oxygen stream.
>
> So I think that that can properly be said to be another distinction over the teachings of these foreign patents.
>
> Does that answer your Honor's question?"

The District Court was convinced that the Linz experimenters had made only two changes from the prior art, that is, changing the character of the nozzle, and increasing the distance of the nozzle from the bath, all of which amounted to a lessening of the oxygen jet impact pressure upon the surface of the metal bath. As stated:

> ". . . The striking disparities in the results of these three series of tests appears to this Court to be attributable solely to differences of impact pressures caused by the variation in the type of nozzle used or nozzle bath distance, or both." (257 F.Supp. at pages 411-412)

[321] Considerable other comments were made variously on impact pressure and have been delineated elsewhere. Nevertheless, in spite of the fact that the District Court was inclined towards the conclusion that the sole changes of nozzle character and its heightened placement over the bath surface constituted the gist of the invention as it reduced the jet's impact pressure upon the molten metal bath, it was during the course of the colloquies between the Court and counsel for the plaintiffs, that the District Court, itself, introduced another factor of the Suess specification (PX-J-39 pp. 13,195-13,196):

> ". . . That was the ratio of the depth-to-surface area"

to which Counsel for Plaintiffs replied:

> "That was an idea that was expressed in the various foreign patents, and it is an idea that was expressed in the original application that was filed."

Here, then, was an additional factor that was brought to the attention of the District Court. Whereupon the District Court asked (PX-J-39 p. 13,196):

> "It is your contention that the concept involved in all of the applications filed by Suess, both in this country and in foreign countries, was this concept, this so-called new concept you have been mentioning here and not just this ratio idea that the defendants have argued? I think that seems to be their position in their belief."

[322] Here, it would seem, the District Court conceived the idea of ratio of bath depth to surface area as something alien and separate from the concept of change of nozzle, and heightening of nozzle for the purpose of lessening "impact pressure", as the gist of the invention. My concern with the final argument concerns whether or not counsel for the plaintiffs met the obligation which was required of him in the representation of his clients? It is apparent to me that the District Court was made aware of factors others than "lessening of impact pressure" as the new concept as of the June 25th series of tests at Linz.

At another time it would seem that counsel again failed because of his reluctance to disagree with the District Court in talking about the procedure in the Patent Office and the changes and modifications of claims as they were originally made (PX-J-39, p. 13,197):

> "THE COURT: Those claims were quite different than any of the prior claims that preceded them over the prior six years.
>
> [Counsel for plaintiffs]: That is quite correct . . . They were *somewhat* different. The limitations in the claims were *different.*" (Emphasis added)

Here we see counsel both agreeing and disagreeing with the District Court. This did not help the plaintiffs' case.

I do not say this in any critical fashion of the person of **[323]** counsel. I had and have for him, as well as for opposing counsel, the highest respect and a great deal of appreciation for their competence during the trial of the *J & L* cases. They showed the highest qualifications and a gentlemanly demeanor. Such attitudes, however, should not prevent any attorney in the trial of a case from pressing his contentions and clarifying the facts and circumstances of the case. If he fails to do so, he benefits neither his client, nor the trial judge. However, I must consider what counsel said at this final argument in order to determine whether there was any fault on the part of the plaintiffs in guiding the District Court into the finding that "lessening of impact pressure" was the final discovery by the plaintiffs which led to the eventual conclusion by the District Court that "avoidance of deep penetration was the gist of the invention".

When (PX-J-39 pp. 13,198-13,199) the District Court attempted to get information of "any material changes in the specification of the original application as compared with the continuation-in-part application", counsel replied that there were some detailed operating conditions and added "but . . . nothing more than an enlargement of the basic ideas that were fully disclosed in those original—in the original application." **[324]** The Opinion reflects that the District Court was not aided by this response, because it appears that its "understanding" (PX-J-39 p. 13,195) that the application of Suess in other countries upon which the patents were issued "were based on an entirely different idea" of "ratio of the depth-to-surface area", and that idea was carried into the District Court Opinion as being the basis of the application filed in the United States wherein twelve claims were ". . . directed to a ratio of bath depth to surface area favorable to circulation as the gist of the invention." (257 F.Supp. at page 380).

What I have seen here was a sporadic appearance of some of the essential factors which eventually culminated in

the final application for the patent in the United States Patent Office. Yet it all seems to have been done with a lack of persuasiveness on the District Court's thinking. I continue to ask the question, was this the fault of the plaintiffs, or did the patent itself lack the impressiveness which would entitle it to letters patent? And yet, the patent itself could hardly have lacked impressiveness, because as we have seen the District Court was impressed with the revolutionary quality of the patent (257 F.Supp. at page 441). The fact too was that the District Court regarded this as ". . . . such an outstanding **[325]** invention" (257 F.Supp. at page 442). I ask then, was the patent in suit of such revolutionary quality and characterization as to be not readily explained, or technically understood? Or, were the two changes made in the early June 1949 tests by the applicants "of reducing impact pressure" non-technical and easily understandable? These questions are in need of answering when, as we have seen, the District Court said ". . . the patentees must be credited with the invention under applicable patent law, because they took the final step *of reducing impact pressure* so as to avoid refractory damage and to create the early fluid slag necessary for satisfactory phosphorus removal." (Emphasis added) (257 F.Supp. at page 419) If it was not of a highly technical character and easily understandable by those skilled in the art of steelmaking, the question then is, why was it of a revolutionary quality, or why should it then be considered "outstanding," and why would Dr. Durrer the oxygen expert of the time in this particular specialized field, say "This work shows a new metallurgy . . ."? (DX-110-E)

And yet going back over the testimony, the District Court was informed by one of the witnesses and again by counsel for the plaintiffs (PX-J-39 p. 13,232) that there was no difference **[326]** in the nozzle type between the prior art and the patent in suit.

It seems as if the plaintiffs' counsel was trying to make clear to the District Court the difference of what was conceptual to the Linz experimenters in June 1949, and what had become conceptual to them when they filed the application for patent both in Austria and in the United States. That there is an enormously patentable difference between the June 1949 experiments and what was incorporated in the patent applications needs no expertise to detect. I am convinced that the plaintiffs' counsel was trying to make this clear without much success. Here, for instance, are his pointed remarks in that connection (PX-J-39 p. 13,236):

> ". . . You must not forget that this particular art was in an embryonic state at the time that these people wrote some of these things in the early days, because they didn't fully understand the chemistry involved, or at least I don't believe they did.
>
> They did an admirable job, however, when it came to filing their applications and pointing out what this *real new concept was . . .*" (Emphasis added)

For anyone who wishes to know what the subject matter of the Suess et al. patent is, and what its instructions are, the **[327]** answer lies in the patent specification itself. From this, it is readily apparent that the specification does not contain the words "Laval nozzle" or "heightening the nozzle from the bath surface from 10 centimeters to 15 centimeters". Even in January 1952, the time of the filing of the patent application, the scientific theory by which the Suess et al. patent worked, was not yet understood, even though it was operating. Yet, it was not necessary that it be understood. *Application of Aufhauser,* 390 F.2d 275, C.C.P.A., 1968.

There are many other phases of the colloquies occurring between counsel for the plaintiffs and the District Court which I could point out, as for instance (PX-J-39 p. 13,264) where the District Court asked whether or not there were any teachings or definitions of avoidance of deep penetration in the patent itself, except to avoid burning the bottom, and counsel replied that the principal statement was made

in relation to avoidance of deep penetration. However, that counsel might have pointed to the teaching, not necessarily a short definition, of the specification which would have answered the Court's question in the following reference to patent (col. 3, lines 36-73) and then have pointed out that the specification states that "The process conducted under these conditions avoids a deep **[328]** penetration of the oxygen gas into the molten bath . . ." (col. 3, lines 73-75) "which seriously impairs refractory life at the *bottom* of the refining vessel." (col. 3, line 75 to col. 4, line 1.) (Emphasis added) And as provided in (col. 4, lines 1-6), "In addition, the impingement area of the high purity oxygen on the central portion of the bath isolates the *refractory walls* of the refining vessel from extremely high temperatures which are developed by the direct reaction of the oxygen and the molten metal". (Emphasis added)

The process is explained to one practicing it that certain chemical actions take place (col. 4, lines 43-67) and then explains that "The oxygen jet thus contacts the emulsion of bath and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly *although the oxygen jet does not penetrate deeply* into the molten metal bath *and is confined to an impingement area at the* central portion of the bath surface." (col. 4, lines 67-72) This, the steel operator is informed, produces a vigorous boiling action "opposed by the pressure of the oxygen jet *only in the area of impingement*" (col. 4, lines 72-74). So that *the high temperature causing the boiling action of the iron is thus* **[329]** *confined* because the operator is informed (col. 4, lines 74 to col. 5, lines 1-5) that "outside of this area it represents primarily *endothermic* reduction of FeO by carbon to form the evolved carbon monoxide, which *reaction thus effectively encompasses the zone of direct oxygen reaction at which the highest temperatures prevail affording a maximum measure of protection to the refractory lining* of the refining vessel." (Emphasis added) It is worth noting that *all* the refractory linings were protected by the Suess process.

So that up to now we have instructions for the method, not necessarily of avoidance of deep penetration but, of conducting the process by means of a nozzle vertically and centrally placed with proper oxygen pressurization, specific diameter nozzle, hemispherical bottom vessel, and ratio within the given limits of the bath depth to surface area.

These teachings which counsel might have pointed out in the specification were much more significant than substituting a regular nozzle for a Laval nozzle, and from heightening the nozzle above the bath. For here we now see specifics and broad ranges and explanations of what, how and why following the teachings produced a high quality finished product, and at the same time preserved the refractory linings.

[330] Plaintiffs' counsel could have referred to the references which comprise the process of the invention (col. 3, lines 16-72) and which contain detailed instructions as to vertical placement, central nozzle control, pressure of oxygen, atmospheres and the like. And further, plaintiffs' counsel might have referred to the instruction in the specification (col. 4, lines 7-25) which instructs upon a suitably designed reaction vessel with attention to ratio of depth of the bath to surface area of the bath.

However, from my inquiries in these matters, I get the distinct impression that the District Court was maintaining that the Suess patent process concerned the limited idea of "avoidance of deep penetration" and that anything vital to the patent should speak of it in those words. And further, that the changes from a Laval to a regular nozzle, and of heightening the distance of the nozzle from the bath, was the "new concept", which eventually became the patent, and therefore the gist of the invention. We are reminded of this as we continue to read the various colloquies with plaintiffs' counsel in this final argument.

As for example (PX-J-39 pp. 13,265-13,266):

"THE COURT: I know. But that isn't taught, is it? Isn't that simply testimony by—who was it? Dr. Elliott?

[331] [Counsel for Plaintiffs]: No, your Honor. It is set forth in the patent where it talking about it at some length in this part appearing, commencing Column 6 of line 5. The importance of this early highly oxiding fluid slag is discussed right there.

THE COURT: I know, but it doesn't speak of that in terms of the avoidance of deep penetration.

[Counsel for Plaintiffs]: No, it doesn't, your Honor.

THE COURT: It says that the process will do that.

[Counsel for Plaintiffs]: That is right. If you avoid deep penetration, then this is one of the things that you are going to get.

THE COURT: Well, it doesn't say that, does it?

[Counsel for Plaintiffs]: I think that is——

THE COURT: (Interposing) It is not in Column 6. What you are referring to there, there is nothing about avoidance of deep penetration to bring about the proper removal of phosphorus and sulphur.

[Counsel for Plaintiffs]: No, your Honor. But I think you have to take all of the statements in context in the patent. That is a part of the teaching of the whole patent. We can't separate the words and paragraphs. I think we have to consider the whole thing in context."

I get the impression here that the District Court was relying less upon what was contained in the Suess et al. patent and more on what it selectively retained from the testimony of the various witnesses. Column 6, line 5 of the patent specification is both informative and instructive to one skilled **[332]** in the art of steelmaking, because it teaches the steelmaker that "formation of an early highly oxidizing fluid slag is of particular value in basic refining when the process is applied . . . in ordinary open-hearth

practice . . ." (col. 6, lines 5-8) It is unnecessary that I cite here the various other portions of the specification which gives a highly elucidating and comprehensive presentation of the process in action. So while the specification tells the steelmaker how his process is functioning, it does not tell him, *in totidem verbis*, to avoid deep penetration, since he will be doing that by just following the instructions in the specification. Thus, the specification does tell him how this intermediate result of avoidance of deep penetration will occur when he operates according to the process.

It is apparent that even though the District Court was embued with the fact at this stage of the case in the final argumen that the "aspects of the invention necessarily follow from avoidance of deep penetration", it is also obvious from a reading of the entire specification that this was fallacious. We see that the specification's teachings of limitations of blowing pressure, vertical and central blowing, together with the other instructions, are abundantly and particularly set out and explained. The law does not demand anything more than this. **[333]** *General Electric Co.* v. *Brenner*, 407 F.2d 1258, (D.C.App., 1968).

In this connection of teachings, I point out also that nowhere in the patent is there any statement that the patent consists of "avoidance of deep penetration of the oxygen jet into the molten metal bath," but that rather, it does state variously that the process avoids deep penetration.

As was set forth by many witnesses, and affirmed by Primary Examiner LeRoy at the first post-trial hearing before me, persons skilled in the art of steelmaking knew that in the prior art deep penetration was a necessity. Four statements contained in the specification relating to the avoidance of deep penetration are nothing more than an assurance to the operator that when he practices the Suess process, he avoids the pitfalls of the prior art.

Nevertheless, the District Court dwelled upon the idea that the change from the prior art from nozzle difference

and higher placement of the nozzle from the bath was the real difference from the prior art, because it avoided deep penetration and was therefore the gist of the invention. If, then, this is fallacious, the question arises, what fault, if any, and to what degree, if any, did counsel for the plaintiffs **[334]** provoke or cause this lack of understanding by the District Court. It is for that reason that I persist in following through in analytical fashion the various colloquies had between the District Court and counsel for the plaintiffs.

From what follows here I get the idea that the District Court was informed several times of the factors comprising the Suess process (PX-J-39 pp. 13,270-13,271):

> "THE COURT: Then it would also follow, I suppose, that all of the other aspects of the invention necessarily follow from the avoidance of deep penetration?
>
> [Counsel for Plaintiffs]: I don't think it can be simplified to that extent, your Honor, because of the possibility that somebody would be able to blow and cause the oxygen jet to cover, we will say, the entire area of the bath. That is not covered by our patent. But I doubt very much that anybody could do that and make good steel.
>
> THE COURT: As I understand it, that is your position, that you can't do that. You have got to blow on the surface and below the surface to some extent.
>
> [Counsel for Plaintiffs]: That's right.
>
> THE COURT: Under the teachings of Suess.
>
> [Counsel for Plaintiffs]: And you have got to create the localized reaction zone, too, your Honor. That is important.
>
> THE COURT: You have to not only create the localized reaction zone, but you have to get below the surface a little.
>
> [335] [Counsel for Plaintiffs]: Oh, yes. No question about that. Because you have to have—
>
> THE COURT: (Interposing) If you don't get below the surface you have a soft blow and it boils out, I suppose.
>
> [Counsel for Plaintiffs]: Right. You have got to have good contact between the oxygen jet that is being blown in there and the metal itself. Otherwise you don't get the reactions."

Yet, the recognition of these factors as they are explained in the Suess patent specification was not aided by the advocacy of counsel for the plaintiffs. This was verified in the District Court Opinion when it condemned the phraseology contained in the claim "discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath (col. 12, lines 12-14) by stating that, "However, the word 'below' would seem to cover even a deep penetration of the bath by the oxygen stream, which is certainly not taught by the specification." (257 F.Supp. at page 438)

The Opinion would seem to indicate that during the final argument with plaintiffs' counsel, there was a hiatus in the thinking, a gap in the chain of comprehending and understanding what the Suess process was and seemingly a sidetracking to what it was not, i.e., a practically one-step physical manipulation of the oxygen jet so as to lessen impact pressure, **[336]** and procure open hearth quality steel from a blast furnace iron in a short time (col. 2, line 69 to col. 3, line 10), without undue corrosion of the refractory walls. (col. 2, lines 36-44)

By now it seems quite obvious that the District Court was convinced that "avoidance of deep penetration" was the one essential factor it was looking for as being the subject matter of the invention, and as such the essence of the invention which should have been required to have been incorporated in the claim. For that reason it seems that instead of using the word "gist" the District Court used the word "essence". Regrettably, when counsel for the plaintiffs attempted to explain to the District Court that "avoid-

ing material agitation of the bath by the oxygen sream" also "embraces . . . this matter of avoiding deep penetration . . .", he did not seem to be able to make his point since the District Court apparently viewed these as equivalents. (PX-J-39 pp. 13,272-13,273):

> "THE COURT: Well, now, *if* that is the *essence* of the invention—that's the avoidance of deep penetration—why isn't that mentioned in the claims?"
>
> [Counsel for plaintiffs]: I think that, as we pointed out a while ago, the things that are necessary are pointed out in the claims, because you speak there about avoiding material agitation of the bath by the oxygen stream; and as I said earlier, I think that that embraces——

[337] THE COURT: Well, then, that means the same thing.

> [Counsel for plaintiffs]: —this matter of avoiding deep penetration, yes.
>
> THE COURT: *Avoidance* of material agitation and avoidance of deep penetration are equivalents, you might say. One is the quid pro quo of the other; is that it?
>
> [Counsel for plaintiffs]: I hate to say that they are exactly equivalent,[47] your Honor . . .
>
> THE COURT: Well, I know; but my question was, you see, *if* the essence of the invention or *one* of the main thrusts of the invention is this avoidance of deep penetration, why isn't that set forth in the claim?
>
> [Counsel for plaintiffs]: Well, I think that it is set forth in the claim.
>
> THE COURT: Well, *it doesn't use that language.*
>
> [Counsel for plaintiffs]: No. That's right.
>
> THE COURT: Well, that's what I mean.

[47] From what I had previously observed "deep penetration" with its bath "stirring" potentials was but one of the several prior art features included in the term "avoidance of material agitation." Others included could be off-central blowing, angular blowing, high blowing, etc.

> [Counsel for plaintiffs]: There is no question but what that language was not used . . ." (Emphasis added)

[338] We have already seen several enlightening insights to the District Court's thinking. It had already accepted "avoidance of deep penetration" as being the "essence of the invention" predicated upon a conditional "if", and it was evidently reluctant to hear counsel's explanation that the term "avoiding material agitation . . . embraces . . . avoidance of deep penetration", without counsel's proffered explanation, "that means the same thing." Yet here again counsel for the plaintiff who should not have submitted so easily, answered affirmatively, but when the District Court assessed them as equivalent and "One is the quid pro quo of the other", counsel attempted once again to make what seems would have been a clarification. At least it might have been an answer and a clarification for the District Court.

Elsewhere I talked about other findings by the District Court on the problems which it posed of circulation in the center of the bath being both up and down at the same time, and of the impossibility of a 1 unit of force-power being able to overcome 3000-8000 units of force-power, and the fact that scientific answers were not available to the District Court.

I am fully convinced that these helped to solidify the District Court's thinking of "avoidance of deep penetration" as [339] the essence", "thrust" or "gist of the invention". Other circumstances such as Ann Arbor demonstrations, particularly Nos. 7 and 9, led the District Court to conclude that deep penetration of the oxygen jet in the bath was not injurious and that, therefore, Dr. Elliott was not credible. I believe they guided the District Court into the conviction that the total difference between the Suess patent and the prior art was the "lessening of impact pressure" of the oxygen jet upon the molten metal

bath, and that this avoided the deep penetration of which the prior art was guilty. There are other circumstances which I have discussed elsewhere and I do not deem it necessary to repeat them at this time.

Thus, there is built into the Opinion the conclusion that by reason of the circumstance that "avoidance of deep penetration" is the essence and subject matter of the invention, it should have been so expressed in the same precise words in the claim. That the District Court was looking for the same language is obvious when it stated (PX-J-39 pp. 13,272-13,273):

> "Well, it doesn't use that language . . .
>
> [Counsel for plaintiffs]: There is no question but what that language was not used, but I think that the——
>
> THE COURT: Was that ever used in any of the claims that Suess offered?

[340] [Counsel for defendant]: Yes, it was.

> THE COURT: I thought it was.
>
> [Counsel for plaintiffs]: I think so, your Honor, yes.
>
> THE COURT: And those were rejected.
>
> [Counsel for plaintiffs]: Well, yes; and the claims were rewritten in order to try to define the invention in such a way that would be acceptable to the Patent Office and which would still cover the invention.
>
> THE COURT: How was that presented to the Patent Office, then, in order to get the final claims allowed? *If* they *rejected it for the avoidance of deep penetration,* then, of course, it was kept out of the final claims." (Emphasis added)

Once more we see what seemed to be a fixed assumption by which the District Court furthered its judgment by using these words, but counsel for the plaintiffs did attempt to rectify that assumption in what follows (PX-J-39 p. 13,273):

> [Counsel for plaintiffs]: They didn't reject it on the ground that the claims called for deep penetration, no, your Honor. The claims were rejected for various reasons, and they were rewritten in order to try to satisfy the Patent Office."

Still we see that the District Court discredited counsel's remarks and adhered to its conception by which it had been questioning counsel during the final argument. Here is plaintiffs' counsel's reply (PX-J-39 pp. 13,273-13,274):

[341] "THE COURT: Why didn't they put that back in, then?

> [Counsel for plaintiffs]: Well, I think that probably the reason they didn't put it back in was that they felt that it was sufficient to set forth this guideline here which is phrased in terms of avoiding agitation of the bath by the oxygen stream. I think those are the words that were put into the claim for the purpose of trying to differentiate over this prior are such as Schwarz and Miles; and in addition to that, these other limitations were put in at the same time—namely, the localized reaction zone and the circulation caused by chemical reactions."

The Court eventually held " . . . that the specification gives the phrase 'avoidance of deep penetration' a special meaning by association with 'necessary and required process conditions, such as fluid slag, avoidance of over-oxidation (undue loss of iron to the slag), and avoidance of slopping.' (col. 3, lines 70-73)." (257 F.Supp. at page 422).

The District Court also eventually defined the significance of "avoiding deep penetration" to steelmen in these words, "Thus according to the teaching of the specification, a steelmaker knows he is avoiding deep penetration within the meaning of the patent if he does not blow deeply enough to cause refractory damage or to prevent the formation of a fluid slag, as Dr. Elliott and Dr. Hauttmann testified." (257 F.Supp. at **[342]** page 422). There-

upon it affirmed its belief in the invention and that it was capable of being accomplished by persons skilled in the art of steelmaking so as to enable them to make good steel.

> "In sum, this Court finds that the specification of the patent in suit, despite certain indefiniteness and inaccuracies, nevertheless complies with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and use the same.' At lease defendant has not sustained its burden of proving otherwise, especially in light of defendant's own testimony that persons skilled in the art could make satisfactory steel following the teachings of the example and that extrapolation to other heat sizes was a simple matter."

I originally started out in this part of the Opinion to discuss the statement by the District Court that the "Plaintiffs also admitted on final arguments that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge were the changes from a Laval to a normal nozzle and an increase in the nozzle bath distance (R. 13,184-13,187)". (257 F. Supp. at page 410) While it would appear that I have strayed from an injury into this pertinent statement, further examination of the record as to why the District Court made this statement and whether or not it was based upon any misconception or misinterpretation of the **[343]** technical phases involved in the case—without fault of the plaintiffs, was necessary.

One may also consider the following (PX-J-39 pp. 13,328-13,329):

> "THE COURT: Even the term 'deep penetration' is not associated in language with the term 'material agitation' as such. I mean you don't find the words 'agitation' and 'material agitation' . . .
>
> But here you have a phrase which, as I understand it, is almost the gist of the patent, or, at least, one of the very important elements, the avoidance of material agitation. And certainly you would agree, I think, that that must be taught.
>
> [Counsel for plaintiffs]: Yes. I think it is taught, your Honor. That is what I am suggesting to your Honor now.
>
> I think that, as I was saying in the first place, the patent tells you blow vertically or approximately vertically on the central portion of the surface of the bath.
>
> THE COURT: But it doesn't go on to say that if you do that you avoid material agitation.
>
> [Counsel for plaintiffs]: . . . But that is the way of blowing, as the evidence shows, which gives you the lease amount of agitation from the oxygen stream itself."

The District Court demanded further proof that the factors which contribute to the avoidance of material agitation were **[344]** actually stated in the specification "in that language" and "in so many words" (PX-J-39 pp. 13,329-13,330):

> [Counsel for Plaintiffs]: Yes, And, of course, where you avoid deep penetration you avoid this material agitation of the bath by the oxygen stream.
>
> THE COURT: Yes, that is what you say. That is true. But the specification doesn't use that language.
>
> [Counsel for Plaintiffs]: That is correct.
>
> THE COURT: It doesn't say that if you avoid deep penetration that material agitation would be avoided. *It doesn't say that in so many words.*
>
> [Counsel for Plaintiffs]: That is correct, your Honor. But I think you must remember also that the prior art teaching is to agitate the bath by deeply penetrating into the bath. So that I think that the teaching of the specification to avoid deep penetration would be a teaching to those skilled in the art that you should avoid material agitation of the bath by the oxygen stream.

THE COURT: Would deep penetration necessarily cause material agitation, excessive agitation? Does that necessarily follow?

[Counsel for Plaintiffs]: I believe so. I think that that is the effect of it." (Emphasis added)

As may be seen, I have intently scrutinized the argument of plaintiffs' counsel purposely to ascertain whether or not **[345]** the plaintiffs were prevented in any way from presenting an understandable and graphic explanation of the Suess patent process. I continuously kept in mind whether the specification clearly defined and instructed on the technical aspects so that those skilled in the art could perform them, and whether the subject matter was detailedly and pointedly set out as claimed in the invention. I also look for what might have been explained in the final argument as the differentiation between the prior art and the new invention.

The plaintiffs here argue that there had been a fundamental misconception by the prior courts of the technical subject matter and issues involved resulting in a misintepretation and misapplication of the patent law to such technical facts. Accordingly, I expended extraordinary efforts in an examination of the Opinions, and of the record upon which they were founded, as mandated by *Blonder-Tongue*, in order to conscientiously arrive at both an understanding of the subject matter of the question of estoppel so that I might fairly and equitably determine the issues raised. Therefore, the general scope of my inquiry was directed at the District Court's statements relating to Dr. Trenkler and Dr. Hauttmann, and of plaintiffs' admission **[346]** on final argument "that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge was the change from a Laval to a normal nozzle and an increase in the nozzle bath distance" from 10 centimeters to 15 centimeters. (257 F.Supp. at page 410)

Dr. Trenkler and Dr. Hauttmann did say that in their early experimentation in June 1949 there were changes in type of nozzle and of nozzle-bath distance. They also stated that these were changes from the prior art of Schwarz and Miles, and that these two changes did not become features in the application by Suess for patent rights. We are informed that there were approximately 250 tests required for ascertaining the circumstances necessary for such a final working process, and that although the experimenters produced good steel with the June 25th series of tests, there is no evidence in the record that steel of open-hearth quality was achieved.

My inquiry shows that counsel for the plaintiffs did feature avoidance of deep penetration as the "new concept" and as differing from Schwarz and Miles, as well as from Durrer and Hellbruegge. It also shows that plaintiffs' counsel while featuring the avoidance of deep penetration put on a "selling **[347]** campaign" to the District Court of "reduced impact pressure of the jet on the bath so as to avoid deep penetration" and that he in very great likelihood oversold this feature at the trial. However, the inquiry shows that the plaintiffs' counsel did not advocate "avoidance of deep penetration" or "reduced impact pressure" as the exclusive feature of the Suess process, although he advocated the others less convincingly. My inquiry shows that he did attempt to advocate "deep penetration" and "heavy impact pressure of the oxygen jet" as prior art devices required for stirring the bath. However, it may not be said that plaintiffs' counsel did not attempt to advocate vertical blowing as against the angular blowing of the prior art; central surface blowing as against the non-specified blowing of the prior art; ratio of bath depth to surface area requirements; prescribed limits within which pressure was to be applied, and of prescribed height distances within the limits as set forth in the specification, all for the purpose of procuring a "localized reaction zone" at the center surface of the bath

to bring about chemical circulation as against mechanical jet circulation. All these and more were the instructions contained in the specification. None of these **[348]** found meaning, since no finding supported their existence in the Opinion.

So it is that while the Opinion credits Dr. Trenkler, Dr. Hauttmann, and plaintiffs' admissions on final arguments, to the effect that there were only two changes, such findings have absolutely no connection with or effect upon the patent's specification. The District Court Opinion attempts to make that connection by finding that the original change of a nozzle and of nozzle bath distance were the changes which provided "a reduced impact pressure of the jet on the bath so as to avoid deep penetration"; that "Such avoidance of deep penetration" was " 'the new concept, the new mental approach' of the patentees" (257 F.Supp. at page 410), and that "Such maximum limit on penetration appears to this Court to be the real gist of the invention by the patentees . . ." (257 F.Supp. at pages 403, 411-412)

The District Court Opinion indicates that this idea of "impact pressure" originated as of the time the testimony was adduced on the experimentations made on June 17th and June 25th, 1949. Thus it would seem that the admissions of Dr. Trenkler and Dr. Hauttmann, as well as of the plaintiffs, including the **[349]** advocacy of plaintiffs' counsel, were not in reality the moving cause for the District Court Opinion's finding that the new invention existed only because of the lowering of the impact pressure.

[350] XVII. Oxygen Availability

It is also incumbent upon me to inquire into the matter of oxygen availability to the prior art patentees, Schwarz and Miles. This is so for two reasons: first, because the plaintiffs in these cases contend inter alia, that the *McLouth* Courts failed to grasp the technical aspects of the case and the real issues involved, and thus were deprived

of the benefit of crucial evidence and witnesses in the first litigation; and second, because *Blonder-Tongue* also directs that, "if the issue is non-obviousness, appropriate inquiries would be whether the first validity determination purported to employ the standards announced in *Graham* v. *John Deere Co., supra.*" (402 U.S. at page 333).

The Schwarz German patent was "as from May 24, 1939," but "allowance of the patent [was] made known on April 8, 1943." It was "published on July 3, 1943." (DX-5A) The Second World War ended on September 2, 1945. The Miles patent application was filed in the Kingdom of Belgium on October 4, 1946, and the patent was granted on November 30, 1946. Oxygen availability for industrial applications should be related accordingly.

The *McLouth* Court of Appeals recognized that oxygen availability affected the non-obvious issue. It said this:

> "Prior to 1950 not a great deal had been done commercially with the use of pure oxygen in the refining process. McLouth contends that this lapse in the steelmaking industry was due to the *unavailability of a method* for producing oxygen cheaply in commercial quantities. Appellants contend that the lapse was due to the *lack of an operable method* for refining steel with pure oxygen. In view of the *conflicting* **[351]** *evidence*, the District Court found that it was unable to ascertain a date when the use of pure oxygen in commercial quantities became economically feasible but held that the unavailability of oxygen in commercial quantities would not necessarily have inhibited experimentation. (257 F.Supp. at page 398). We agree with this finding of the District Court but must also note that the lack of commercial quantities of oxygen would affect the quality of the disclosures in the prior art on matters such as specific commercial operating conditions, demonstrative examples, and the like. Moreover, the commercial unavailability of oxygen would explain the absence of any prior attempts to apply the Schwarz and Miles Patents and would thus weaken any inferences that such a lapse in the industry might raise on the issue of obviousness. Thus, the im-

portance *of more direct evidence* on the issue of obviousness becomes even more apparent." (Emphasis added). (400 F. 2d at page 42).

Specifically on this point the District Court said:

> "It is *disputed* at what point in time pure oxygen became available in large quantities for use in commercial production of steel. *Defendant contends* that oxygen did not become available inexpensively in large quantities until the late 1940's, so as to inhibit the development of a commercial oxygen steelmaking process before that time. *Conflicting evidence* on the point leaves this Court *unable to fix* with certainty any date on which oxygen became available inexpensively in large quantities for commercial production of steel." (Emphasis added). (257 F. Supp. at page 398).

I note in advance that in the District Court there was "conflicting evidence on the point" which left the District Court "unable to fix" the oxygen availability date. But from an examination of the record, "conflicting evidence" was presented in many other phases of the trial, and yet the trial judge assumed the function as a fact finder to make determinations and fix the facts from conflicting evidence as they were presented, as occurs in practically every case. This then was a failure on the part of the District Court to **[352]** present a relevant fact which could aid in the question of determining nonobviousness and left that matter to the Court of Appeals.

The Court of Appeals, however, accepted this failure by the District Court to arrive at a decision on the date of oxygen availablity on the more positive side for the benefit of the defendant as "lack of commercial quantities of oxygen . . . [as] would affect the quality of the disclosures in the prior art on matters such as specific commercial operating conditions, demonstrative examples, and the like." (400 F. 2d at page 42). From this then the Court of Appeals provided what seems to be a positive

finding of fact that "the commercial unavailability of oxygen would explain the absence of any prior attempts to apply the Schwarz and Miles Patents . . ." (400 F. 2d at page 42). Therefore, I deem this failure on the part of the District Court to arrive at a determination on the date of oxygen availability as highly pertinent in lending a factual circumstance to support at least the one phase of obviousness, or non-obviousness, of the Suess et al. patent. Accordingly, I have inquired into the record on this phase of the matter.

I have already reported on a part of this specific matter in my discussion of the Durrer and Hellbruegge experimentations at Gerlafingen, Switzerland (See No. XV, Prior Art Changes). I discussed the fact that both Durrer and Hellbruegge had been working on oxygen smelting on an industrial scale (PX-J-14 p. 4514), before January, 1941. I discussed the testimony of Dr. Hellbruegge and particularly stated the fact that in the late 1930's adequate quantities of oxygen were available for experimental work. He stated that in developing "a new metallurgy" commercial quantities of oxygen were not **[353]** required, but merely an adequate quantity to carry on experimentation. Thus, this would prove what the District Court said that:

> "However, in light of the limited experimentation with oxygen in steelmaking as early as the 1930's, the alleged unavailability of oxygen for commercial production before the late 1940's would not necessarily have been an inhibiting factor on experimentation with oxygen in steelmaking." (257 F. Supp. at page 398).

What is more important is that Dr. Hellbruegge testified that large quantities of oxygen were available about 10 years before his "Stahl and Eisen article of December 21, 1950" (PX-J-15 pp. 4902-4904). I note here particularly that Dr. Hellbruegge, as well as Dr. Durrer were defendant witnesses at *McLouth*. I do not forget that the McLouth

record reveals the fact that in 1928 Dr. Fraenkl discovered the process of extracting oxygen from the air on tonnage quantity basis, and that this discovery was assigned to the Linde Company. The discovery was known as the Linde-Fraenkl process. When Dr. Durrer was asked in cross-examination, during the trial of the case (PX-J-16 p. 5068), relating to the Linde-Fraenkl process,

> "Q. (By Mr. William Webb) And by making it cheaper, did that make it available for use in the metallurgical processes, Doctor?
>
> A. Yes."

Although oxygen was used from portable bottles during the 1930's, Edward John Prince, plaintiff's witness, testified that (PX-J-17, p. 5333) at Appleby-Frodingham they piped the oxygen which was brought in by cars from a central plant in 1936 or 1937. He also said that in 1947, the Dominion Company in Canada had an "on-site plant" from which "the oxygen was piped to the various **[354]** departments."

But the testimony of Dr. Durrer and Dr. Hellburegge on this subject of oxygen availability did not stand alone. There was other defense testimony in this regard. For instance, there was the testimony of Lyle J. Johnson, Vice-President of Engineering of McLouth, as follows (PX-J-11, p. 3443):

> "Q. And as of 1940, there were a number of tonnage oxygen plants that had been constructed?
>
> A. Yes. I do not know the exact number.
>
> Q. That would have been suitable for this type of usage?
>
> A. Yes."

We bear in mind also that it was the defendant's contention which was adopted by the Court, that "oxygen did

not become available inexpensively in large quantities until the late 1940's, so as to inhibit the development of a commercial oxygen steelmaking process before that time." (257 F. Supp. at page 398). Since it was the defendant's burden to prove that contention, its failure to prove it, did not make it the fact which it alleged. Moreover, since such evidence related to both §§101 and 103 of the patent statute, as well as to the relationship of non-obviousness, the burden was upon the defendant to prove such unavailability of oxygen by evidence which was at least clear and convincing. *Trio Process Corporation* v. *L. Goldstein's Sons, Inc.*, 461 F. 2d 66, 70, C.A. 3, 1972.

In any event, not only did the defendant fail to prove such a contention, but its witnesses in effect contradicted that contention, and the District Court could have so found —as it did with the other unproved contentions (257 F. Supp. at pages 395, 406, 418, 424), thus furnishing no basis for the **[355]** Court of Appeals to hold that ". . . the commercial unavailability of oxygen would explain in the absence of any prior attempts to apply the Schwarz and Miles Patents . . ." (400 F. 2d at page 42).

So far as I can see in the record, any bare "conflicting evidence" arose between the defendant's own witnesses and not from anything which the defendant's witnesses contradicted in the plaintiffs' testimony. Under these circumstances there can be no basis for a finding of fact that availability of oxygen for industrial purposes did not exist after the Schwarz patent was issued.

Although it was not mentioned in either *McLouth* Opinions, it is a fact that the Second World War disrupted the orderly inventive process. Nevertheless, it would appear that if the Schwarz patent, for which application was made in 1939, had any value at all, it would have been utilized by the German authorities. That this was not done may suggest and support a conclusion that it was incapable of being industrially utilized because of a lack of sufficient

quantities of oxygen, or because it was unworkable or could not produce according to the needs of the German war efforts. It may also be speculated that the Miles patent was not utilized because of the decreased steel demand after the war, or because it was not productive of the results which it claimed, or because there was no available oxygen for its industrial utilization during the period from 1946 to 1949. While this is purely speculation, one may reason that during the war years intense concentration would have focused on augmenting steel production.

By analogy one may consider the development and research on "U-235", **[356]** which contained the anticipated miracle energy which would outdistance anything yet known to man. To develop this some of the greatest scientific minds, and energy were secured from all parts of the world in order to produce the first atomic bomb.[48] In a similar manner, many scientists in Europe knew about the concept of processing iron into steel by the use of oxygen applied to the surface of the bath, and had been experimenting with it for a number of years. If Schwarz's theory was as utilizable as he contended in his patent as early as 1939, and even earlier in his experimentation, and in view of the knowledge that a method for obtaining pure oxygen had already been presented as early as 1928, then one would have anticipated more rapid development in iron refining.

It is apparent from the record that even prior to Schwarz's patent, there were a number of plants already in production of pure oxygen, and that these plants were dispensing it in bottles and transporting it to the users. The record indicated that oxygen-producing plants could be constructed at the site where it was to be used—and that was what the Suess patentees did, thus avoiding the necessity and expenses of bottling and transporting. The

[48] This will be remembered as the "Manhattan Project."

question arises, if the Schwarz patent was as good as it claimed, why would not the H. A. Brassert & Co. of Berlin-Charlottenburg, by which Schwarz was employed, have erected the necessary oxygen plant at the place of manufacture of steel, while, as we shall soon see, others in Europe constructed such plants. That this was not done raises the presumption that the Schwarz patent was not within **[357]** the competence it claimed; additionally, as was afterwards shown by Durrer and Hellbruegge at Gerlafingen, the Schwarz patent produced steel of an inferior quality, and in the course of its operations, the refractory linings of the vessel were quickly destroyed.

Although I have presented here what appears to be conjecture, it is in reality not so much conjecture as information ascertaned from published reports. I have considered the positive evidence submitted by the defendant McLouth of the availability of oxygen sufficient for steel manufacture. I conclude that this state of the evidence in *McLouth* should not have supported any attack on the element of non-obviousness of the Suess process. Furthermore, for the purpose of resolving any doubts in this connection, I have examined the relevant published periodicals presented to me by counsel. These clarify the scientific progress relating to the development of oxygen use and its availability, as well as economic costs. From all of these it appears that in the early days after 1928, the first use of the oxygen tonnage process was for procuring nitrogen from the air to be used as fertilizer, while the purified oxygen found practically no use at all. That is not to say that there was no experimentation going on both in Europe and in the United States. I do not concern myself here with ordinary air as it was used in pneumatic blowing, but only with oxygen and oxygen-enriched air as efforts were made to find greater productivity with its use.

Published Reports

From the AISI (American Iron and Steel Institute) Yearbook 1920, we learn **[358]** in an article entitled "The Future of Oxygen Enrichment of Air in Metallurgical Operations" by F. G. Cottrell, Director of the Bureau of Mines, Washington, D. C., that the Government had built an installation for air separation at Mussel Shoals, Alabama during the First World War. This consisted of thirty of the largest sizes of Claude units. Both Carl Linde of Munich and Georges Claude of Paris had innovated the commercial development by which air separation into nitrogen and oxygen was made through liquefaction and distillation (see page 109). However, we learn that the cost of oxygen at that time was from $25 to $30 per ton. The knowledge of its use was very narrow, restricted primarily to the fields of cutting and welding, and for these purposes bottle oxygen was sufficient.

Another paper presented in the same periodical was from Fred E. Norton, Vice-President, Jefferies-Norton Corporation, Worcester, Massachusetts, who said (at page 127): "The cost of oxygen depends directly on the use to be made of it. If there is no use for the oxygen, the matter of cost is without interest." This was said after "some seven years' investigation of the causes of the high and prohibitive cost by the existing methods of air separation" by which oxygen was produced. He did assert that the cost could be reduced to about one-twelfth by reason of the "present processes". (at pages 127-128). He then followed this up with this statement: "The possibility for cheap industrial oxygen exists. It is up to the metallurgical industry to create a demand and put the oxygen to work." (at page 134). This was corroborated by another statement in the same publication by E. A. W. Jefferies, Manager, **[359]** Gas Producer Department, Morgan Construction Co., Worcester, Massachusetts, who said: " . . . the availability of oxygen at the extremely low cost which is

now in sight gives another large promise of economy in steel making." (at page 140). His viewpoint was directed to the use of oxygen in the blast furnace.

A report entitled "The use of Oxygen or Oxygenated Air in Metallurgical and Allied Processes" was published by the Department of the Interior, Bureau of Mines in July, 1923. The report of a previously appointed committee was made by F. W. Davis, a metallurgist in the Bureau of Mines Station, University of Minnesota. The study revealed that:

> " . . . the comparatively small demand for the product [oxygen] has prevented the installation of large units suitable for metallurgical processes . . ."

The report stated:

> "This committee has made a thorough survey of the existing processes for the manufacture of 99 percent oxygen. The conclusions reached by this survey are that the comparatively small demand for the product has prevented the installation of large units suitable for metallurgical processes, with corresponding economies, and by far the greater proportion of the present cost of oxygen represents the cost of transportation, storage and service. Large oxygen manufacturing plants can be built to serve metallurgical purposes directly, which, by virtue of their large production and correspondingly increased efficiency, together with the fact that no compression in cylinders, storage, transportation, or service will be required, will be capable of delivering oxygen for the processes at a cost not to exceed $3 per gross ton. In other words, the Committee finds that the oxygen industry is now able to make plants for supplying large quantities of oxygen to metallurgical industries at low cost." (at page 4).

The thinking of the use of oxygen still lay in its**[360]** application in the operating of the blast furnace, open-hearth furnace and Bessemer furnace.

During these years, and as they continue into later years, more than thirty steelmen and more unnamed steelmen were active generally in the field of oxygen refinement (PX-308) (PX-J-16 p. 5112). The list apparently included John Miles of John Miles & Partners (London) Limited, the steelmaking company in Great Britain, as well as C. B. Schwarz of H. A. Brassert & Company.

One year later in June, 1924 David reported in a paper to the Association of Iron and Steel Electrical Engineers in a report published by permission of the Director, United States Bureau of Mines. The title of the paper was "Some Applications of Oxygen to Ferrous Metallurgy." In this paper he recited that large oxygen manufacturing plants could be built to serve metallurgical purposes directly, and that "in other words, the committee finds that the oxygen industry is now able to make plants for supplying large quantities of oxygen to metallurgical industries at low cost." (at page 340). Davis regretted that the then available refractories were incapable of being subjected to thermal conditions created by the use of oxygen and recommended the necessity to change materially furnace design and practice.

In a translation from a publication in 1925 in Stahl & Eisen, Volume 45, pages 1873-1878, written by J. Haag Oberhausen, there was the report that the Americans were working intently on the solution of the problem of producing oxygen in large quantities and at so low a cost that the use of oxygen enriched air by the steel industry would be economical. He also reported that in Germany certain plants were conducting experiments on a larger scale, and particularly **[361]** at a Bessemer plant "in refining and in converters".

Up to this time Russia was interested in the blowing of oxygen enriched air and pure oxygen into the Bessemer as revealed in the publication Kislorod (Russian) in 1945 by M. S. Shapovalov, vol. 2, No. 1, pages 25-30. In it the

author presented many details of the problems involved and the need for finding solutions. Among the problems were the poor quality of metal obtained as well as the effect upon the wearing out of parts of the vessel "in view of strong localized overheating of the bath". Of interest is his statement (at page 7):

> "The idea of using an oxygen blast in the converter processes is quite old. The problem was studied first in a paper by F. Wust and L. Laval. Later on (in 1923) a paper by F. Davis on the same subject appeared in which the beneficial influence of oxygen-enriched blast on the metal bath in the converter was pointed out." (Footnotes omitted).

In the Iron and Steel Engineers Yearbook in 1948, a report entitled "Oxygen Uses in Steel Production" by J. H. Zimmerman, Manager, Development Division, Linde Air Products Co., summarized much of the development and research work accomplished in the use of oxygen in the open-hearth. It indicated that over 6,000 heats using oxygen in some 34 furnace shops, the majority of which had availed high purity 99.5% oxygen "supplied from existing liquid oxygen systems because of its availability in substantially large volumes and ability to serve high demand rates."

After the delivery of the paper by Zimmerman, a discussion period was held by three steelmen. One of these was A. G. Robiette, Director, John Miles and Partners, London, England. He told them what was being done in England in **[362]** regard to the use of oxygen, and said that they started with actual pilot scale experiments in about 1945. He said that they rejected the idea of using oxygen as an adjunct to the open hearth furnace and thought "you could convert your pig iron into steel without the use of any fuel whatsoever and our experiments have been directed on those lines." This was done in an electric furnace with 90% oxygen. He reported that the product contained about half the oxygen found in open

hearth practice, and that heats of steel had been produced from straight carbon iron made synthetically just to prove that this could be done. He stated finally that "We have developed a method of blowing, which does not employ any lances whatsoever. It is blowing with jets spaced from the surface, and there are two production size plants going up in Sweden for using this process, as well as one in France and one in England." Robiette did not report on the unwanted element contents remaining in the iron nor upon the condition of the refractories in their "actual pilot scale experiments".

Since I report upon a paper published by Robiette one year later, I reserve my comments in this connection for later discussion.

Also, in the same year, 1948, in a paper on the "Utilization of Oxygen in Smelting Low-Grade Ores", Dr. W. M. Pollitzer, Technical Industrial Intelligence Division, Department of Commerce, Washington, told of "the Gute Hoffnung Huette plant", Omerhausen, Rheinland, as being "the first big steel combine in Germany, and, as far as it is known, in the world, to build a blast furnace for experiments with oxygen-enriched air." It was reported that this was accomplished in 1933. The experiment used more than 26% enriched oxygen air and was found to be unsuccessful.

[363] This same report discussed the use of oxygen in the German iron and steel industry at Suddeutsche Kalkstickstoff Werke, Trostberg, in Eastern Bavaria, where it was decided to utilize "cheap oxygen" because the Linde plant was manufacturing nitrogen as fertilizer, leaving the oxygen by-product for which there was little use. The responsible German Government Board decided to avail itself of this cheap oxygen by building a low shaft blast furnace and using a high concentration of oxygen.[49]

[49] I report elsewhere that in and around 1944 Dr. Hellbruegge went to Trostberg to work with Dr. Durrer on a large low shaft oxygen furnace. This most likely is the same low shaft furnace which was built by reason of the utilization of the low cost oxygen from the nitrogen fertilizer plant. (PX-J-14 p. 4521). Dr. Durrer spoke of the test at Gute Hoffnung Huette, Oberhausen, Rheinland, run in 1931 (PX-J-16 pp. 5067-5069) which were smelting tests suing oxygen enriched air in a low shaft furnace. He met with Dr. Karwat and Mr. Fraenkl as early as 1929 with relation to this work.

In 1948 Dr. W. M. Pollitzer reported in a paper entitled "Utilization of Oxygen in Smelting Low Grade Ores" that

> "The most interesting example of oxygen-enriched blast in German iron and steel industry is at the Suddeutsche Kalkstickstoff Werke, Trostberg, in Eastern Bavaria far from all raw materials necessary for iron and steel production. The plant was built because of cheap power. A strange situation existed insofar as the manufacture of fertilizers produced oxygen as a by-product (nitrogen being the main product) from the Linde plant . . . In order to utilize this cheap oxygen the German Government Board responsible . . . decided that a low shaft blast furnace using high concentrations of oxygen should be built at Trostberg . . ."

Also in 1948, Julius Strassburger, Manager, Department of Service and Maintenance, Weirton Steel Company, presented a paper before the AISI entitled **[364]** "Tonnage Oxygen—Versatile Aid . . . for increasing iron and steel output", in which he discussed the use of oxygen for enriching the blast for the blast furnace and to accelerate combustion and decarbonization in open-hearth furnaces and for enriching the blast in the Bessemer converters, where dictated by economic and local plant conditions. He reported that during World War II, the United States, in conjunction with the National Defense Research Council, "together with the technical talent of this country" produced portable and stationary oxygen plants for use in the Pacific, on shipboard, and at other battle fronts. He stated that as a result of this development, necessary

knowledge was obtained to build large plants without chemicals for the production of tonnage oxygen and "a new tool was made available for expanding the production of iron and steel". He discussed the cost and arrived at the figure of $3 per ton of oxygen.

Later in 1956, Julius Strassburger, then Assistant Vice President, National Steel Corporation, Pittsburgh, Pennsylvania, presented a paper entitled "Blast Furnace Oxygen Operations" before the general meeting of the AISI in New York in which he said:

> "In 1946, approximately ten years ago, the Weirton Steel Company installed several small pure oxygen plants for the production of 99.5 per cent oxygen for general steel plant use, such as scarfing, welding and scrap cutting . . ."

From the paper I conclude that the oxygen was not being used as an agent for conversion of pig iron into finished steel, as was done by Schwarz, Miles, Durrer and Hellbruegge, and eventually by the Suess patentees.

Of relevant interest is a statement in this report that:

> [365] Considerable theoretical studies were made by the United States Bureau of Mines during the decade of 1920 to 1930 on the use of oxygen in blast furnace operations. The next historic step in the development of the oxygenation of blast furnace air was a result of the development of the Linde-Frankl tonnage method of producing oxygen in Germany. This process paved the way for obtaining tonnage oxygen at relatively low costs, and this factor encouraged Lennings in his large scale pilot work which he conducted at Oberhausen, Germany between 1933 and 1940." (at page 1).

Further information on the years in question is contained in an article entitled "The Influence of Oxygen on World Steelmaking". This article was printed in the December, 1959 issue of Iron & Steel. Dr. D. W. N. Pitts, M.Sc. and J. L. Harrison, F.I.M. stated that "One of the first open-hearth flame enrichment trials of which we have detailed technical (sic) records was carried out in 1923 by the United States Steel Corporation at their Homestead works." (at page 567). In the next ten years, the report states, as far as the supply of oxygen was concerned, evaporated liquid oxygen became available while, in 1930, the Linde-Frankl distillation cycle was introduced which then made possible the provision of tonnage oxygen. Since that time plants have been designed and installed in Britain and other countries with improved overall efficiency and lower tonnage oxygen costs. They also tell of the economic and political upheavals in intervening years. In their words:

> "In view of the fact that relatively cheap oxygen was available as early as 1930 either as evaporated liquid or from tonnage plants it might appear surprising that the encouraging results of the early metallurgical trials were not more rapidly followed up. In fact, these delays were largely due to the economic and political upheavals of the years before 1945. Prior to the war there was only a limited demand for steel and the economic atmosphere was not conducive [366] to experiments whose function was to increase productivity on a plant that was already working under capacity."

Since that time, and I assume that the year 1945 is referred to, the international demand for steel had been expanding and with it the use of oxygen and metallurgy had grown. The developing steel market stimulated the introduction of techniques which in the first instance were designed to increase production. If so, I question why the Schwarz process had not been as immediately successful as was eventually the Suess process. All the publications are devoid of any mention of the Schwarz process. In fact, an article by Schwarz in 1949 practically ignored his own process.

In 1949, a paper entitled "The Present State of Development of Oxygen Refining in the Siemens-Martin and Electric Furnaces" (translation from German), was published in "Radex Rundschau" by von C. V. Schwarz. This was approximately 10 years after Dr. Schwarz had filed for a German patent and 6 years after it was published. In this discussion on oxygen blowing in Siemans-Martin and electric furnaces, he said (pages 2-3):

> "These (sic) were no large-scale experiments in Europe during the war. In comparison, after the war until the beginning of 1948, several thousand oxygen heats had already been melted in the United States, showing very good results with pig iron ore melts and extra soft scrap-pig iron melts, and bringing the process to a definite operational stage."

It is apparent from the translation as well as from the sketches contained in the original German paper, that Schwarz was talking about several thousand oxygen heats as experiments "melted in the United States" as they related to the open-hearth and electric furnaces. However, he also discussed the **[367]** application of oxygen to blast furnaces. It is of particular interest that he did not discuss the Schwarz patent method as it might have been experimented upon or utilized in the metallurgical industry during the years under discussion.

This report stated that the Weirton Steel Company, realizing the advantages of the process, had "provided for an oxygen installation with a capacity of approximately 110,000 tons per year of 10,500 standard cubic meters per hour to increase their steel production about 500,000 tons per year . . . The total price of the installation is indicated at $4,000." After discussing the make-up of costs and amortization, he said that "Recently manufacturing costs of $8.82 per ton including amortization were announced." I am curious as to why in 1949 Dr. Schwarz would make such statements when and if his

patent of 1939-1943 was productive of industrial steel as he claimed, and particularly during the time of intense experimentation both in Europe and in the United States on the expanding use of oxygen.

Also in 1952, Dr. Schwarz gave a report of the steel plant committee of the Association Iron and Steel in Genoa. It was entitled "Blowing of Basic Bessemer Pig Iron With a Free Jet Lance" (DX-183E). Actually this report is a repetition of his discussion (DX-182A). At page 3, Schwarz stated that the Laval nozzle was used in Switzerland and the United Kingdom during the war without success. If then this use was in commercial operations, it can be assumed that 0_2 was available in commercial quantities.

From all that was reported by Schwarz in these two papers it is obvious **[368]** that he never claimed that "good steel" was produced by these tests. Although his discussion and "Table 1" evidenced the fact that nitrogen absorption was diminished, there is no mention of ductility, malleability or other relevant criteria qualities in steel required in its industrialization. Table 1 provides a partial analysis of the finished product, but it only measured the levels of carbon, manganese, phosphorus and nitrogen. Remembering that German industry in the 1930's and early 1940's was linked directly to the government, it can be assumed that the industrial use of oxygen would not have been as strictly geared to profit as it would have been in private industry. Thus, a private corporation might have hesitated in making immediate use of oxygen resources, whereas the stress upon a government at war to use existing facilities to their utmost would be no inhibiting factor in the production of badly needed steel, if the process was what Dr. Schwarz claimed it was in his patent.

Just as I scrutinized the report of Schwarz in 1949, I also examined closely a second report by A. G. Robiette,

M.Sc., F.I.M., published in the Iron and Coal Trades Review of May 28, 1948, speaking of the use of oxygen for steelmaking—"Methods of Application and Operating Results". A. G. Robiette, a Director of John Miles & Partners (London), read a paper before the Norwegian Metallurgical Society on April 26, 1948 in Oslo. It will be remembered that John Miles made applications in Great Britain on May 3, 1945, June 15, 1945, January 4 and 11, 1946 and was granted a patent.

In the paper delivered at Oslo, he reviewed various applications of oxygen. **[369]** This he said was made possible by the developments in the production of cheap oxygen by the Linde-Frankl and other systems. He said that these "have so reduced the cost of oxygen that it can now be seriously considered both for combustion systems and for the refining of pig iron and the production of steel." (at page 1103). In discussing the application of oxygen in its use as a refining agent in open-hearth or electric furnaces, Robiette suggested, as did Miles in his patent, that for carbon removal the oxygen was to be injected "into the bath" and that instead of one or two jets or lances "a large number, say, eight or ten small high-velocity jets should be used." (at page 1104). He said that this would spread the "disturbance effect" over the whole bath. Robiette concluded (at page 1106):

> "The use of oxygen for steelmaking, though still in its infancy, has brought about a new set of physical conditions which, if taken advantage of, can materially assist in improving both the quality of the product and the efficiency of the steelmaking operation. The problem must be approached with an open mind and it would be wrong to assume that oxygen is best applied to existing processes and existing equipment. All the many and various physical problems must be studied and all pre-conceived ideas of existing steelmaking plant and processes discarded. This is not meant to imply that oxygen may not in certain cases be used to assist an existing process especially as an interim measure, but if a fresh start were made, it has to be determined how this new tool, which has been put in the hands of the metallurgist, can be best applied."

Again, nothing was said about either the Miles or Schwarz patents, but rather attention is directed to securing a "fresh start" with a "new tool". These remarks by a director of John Miles & Partners (London) Limited are indeed strange, if in 1948 the John Miles patent was the "remedy" which John Miles **[370]** stated it to be in his application. It is also remarkable, if in fact the Schwarz patent process was workable and capable of producing high grade steel of a quality equal to that of open-hearth production. Additionally, in 1948 Robiette, who talked about direct oxygen conversion of pig iron (as claimed by Schwarz), did not even mention the Schwarz patent—and even more remarkable he did not mention the John Miles patent by name. This is unusual, if in fact these were already practical and accomplished processes for which they were all searching in their experimentations.

I make two observations from Robiette's remarks. First, that Miles steel works were experimenting with oxygen application to pig iron conversion into steel, and that no industrial applications were yet accomplished. However, I do not disregard the statements of Robiette in 1948, when in conversation with other steelmen, he had stated that " . . . there are two production size plants going up in Sweden for using this process, as well as one in France and one in England." If such plants actually were established in the 1940's it is highly unlikely that they would have been overlooked at the *McLouth* trial or at the trials before me, if in fact such production plants were successful with the Miles patent. I assume that the "production size plants" going up in Sweden and using this process related to the work conducted by Drs. Durrer and Hellbruegge at Gerlafingen. As for those in France and Eng-

land, nothing more seems to be reported, although a search of publications up to 1970 fails to reveal any information in this regard. Second, no complaints or objections were made by Robiette that oxygen was unavailable or unobtainable for such industrial applications. Furthermore, Schwarz made no such complaints in his **[371]** report a year later.

While the Schwarz and Robiette articles give us information on the "experimentation" which was going on with the application of oxygen in the making of steel and of its proportionate lack of utility in that field, the articles are more informative of the fact that neither the Schwarz patent nor the Miles patent had yet provided the "remedy" for converting pig iron into steel as was eventually accomplished in 1950 by the Suess patentees. In addition, the articles demonstrate that oxygen was in sufficient abundance for such industrial applications as would be commensurate with the needs of the prior art patent processes.

It is fairly obvious to me from the evidence submitted before the *McLouth* District Court and from these various historical published reports on the subject of oxygen use in the steel industry, that at all pertinent times oxygen existed and was available for manufacturing purposes, and that no steelmaker or "experimenter" was handicapped by reason of the unavailability of oxygen.

Whether or not this was made abundantly clear to the District Court in *McLouth* is a question which I must ponder in connection with all other matters of equity in this, my assignment, to ascertain whether or not the plaintiffs contributed such fault in the conduct of the *McLouth* case as to be equitably and justly denied the right to pursue these *J & L* cases on the basis of *Blonder-Tongue* estoppel.

[372] *Conclusion*

While Carl Linde and Georges Claude had prior to 1920 conceived the idea of extracting oxygen from the air, and

making it available in bottles for storage and transportation, it was not until 1928 that Fraenkl introduced the method of making tonnage oxygen available on a large scale. At that time in Germany, the Linde-Fraenkl plant was established and in other places, including the United States, a large number of plants produced oxygen and made oxygen available for scarfing and oxyacetylene uses. The early thought was in attempting to enrich the air which was introduced into blast and Bessemer furnaces for speeding up the steel process. However, too many disadvantages arose which made it impractical. After the Linde-Fraenkl process was divulged, the United States Government procured portable oxygen-making plants which it used during the Second World War. In West Virginia, the Weirton Steel Company had established a plant in 1946. In Germany, Dr. Carl Schwarz of H. A. Brassert & Co. was issued a patent on surface application of oxygen to molten metal but as late as 1949, it is obvious that Dr. Schwarz had not yet arrived at a practical method of industrial steelmaking. In 1943 and 1946, John Miles of the John Miles & Partners (London) Limited, a steelmaking company in Great Britain, also was issued a patent, but it is apparent from a director of that company, one Robiette, that the Miles process was still in its experimental stages. In any event, it is apparent that relatively cheap oxygen was available as early as 1930, either as evaporated liquid or from tonnage plants. It was also true that oxygen plants were being constructed and could be constructed at **[373]** the sites of steel mills for cheap tonnage oxygen. However, while nitrogen was being recovered for use as fertilizer by this method, no substantial use for the cheap oxygen by-product had been as yet discovered. While the later war years and post-war years found a lag in the steel market demand, experimentation continued on oxygen utilization in the steel industry. Both Schwarz and Miles, connected as they were with steel manufacturers, also continued experimentation, but neither

were instrumental in bringing about an oxygen steelmaking plant in accordance with their patented processes. Neither, in published papers, claimed anything more than experimentations; and neither claimed that he had insufficient available oxygen for making his process workable.

So that in the early 1940's, it was possible to build a plant for the industrial application of oxygen, yet no unusual occurrence had taken place up until 1951-1952 when the Linz plant was established for tonnage oxygen used directly in steel conversion.

From the viewpoint, then, that the cost of installing the oxygen mill with the use of a vessel capable of being inclined on a trunnion, and for the economical recovery of high quality steel from iron in a matter of 20-30 minutes as against eleven hours under the open-hearth method, the cost of the oxygen which prevailed during the 1940's would have proved no hindrance to anyone who wished to follow the Schwarz or Miles patents. In any event, the *McLouth* record is devoid of legal proof bearing upon prior art obviousness and utility in derogation of the Suess et al. patent.

[374] **XVIII. Court of Appeals**

I said earlier that there was some noticeable difference in the thinking in the opinions of the Court of Appeals and the District Court. However, before discussing these, I believe it is imperative that I point out that the Court of Appeals accepted a great deal of the conclusions made by the District Court; the most critical of these was that "avoidance of deep penetration was the [subject matter and] gist of the invention". This is reflected in its various comments throughout its opinion, and by its interpretations and thinking in this respect, and particularly as it related "avoidance of deep penetration" to the continuation-in-part application's first four claims and following claims, and as the District Court had found that the

chemical aspect of the Suess patent had been obvious to prior art. However, at no place in its opinion does the Appeals Court mention why it accepted this finding of the District Court (400 F.2d 44-50) and barely mentions the mechanical or physical aspect which the District Court found to be an invention—that is, the "reduction of impact pressure" and which the District Court found was discovered and therefore invented by Suess et al. experimenters. (257 F.Supp. at page 48-50).

[375] Although the Court of Appeals affirmed the ultimate determination of the District Court on the grounds that the claims of the Suess et al. patent over-claimed the invention and that the claims cover the prior art (400 F. 2d at page 38), its determination held that it was "unnecessary to consider the correctness of every ruling of the District Court" (400 F.2d at page 38). Nevertheless, it went on to say that,

> "On the other hand a consideration of the factual background of this case and of the errors we find in the District Court's ruling on obviousness will aid in understanding the reasoning by which this Court has reached its decision." (400 F.2d at page 38).

Following through on this a little more, the Appeals Court in discussing the McLouth contention that it paid $100,000.00 to the plaintiffs for know-how, said that the plaintiffs (appellants) contend that the patentees' new concept "• • • was the direct antithesis of the thinking then prevalent in the steelmaking art". The Court of Appeals said,

> "This penchant of the patentees for creating a verbal antithesis to distinguish every patent that might serve as an interference reference has raised other problems of divining exactly what novel element the patentees claim and how that novel element might be meaningfully distinguished from the prior art." (400 F.2d at page 41).

The Appeals Court then followed through with the statement that the appellants "say that the Suess patent teaches **[376]** 'avoidance of deep penetration', where the Schwarz and Miles patent taught 'deep penetration'. But 'avoidance of deep penetration' as an abstract phrase means no more to one skilled in the art then does 'deep penetration.' Depth of penetration can gain meaning only from the limitations placed upon it by the patents and from the knowledge that may be attributed to an ordinary worker skilled in the art." (400 F.2d at page 41).

It thereupon took upon itself the attempt "to distinguish inventive experimentation from mere development of know-how in an art with which the Court has no familiarity." (400 F.2d at page 41). It concluded that the ultimate distinction was one of law because it amounts to a determination of obviousness or non-obviousness. It then made a series of conclusions, holdings and findings.

First: The District Court's conclusion of non-obviousness was erroneous because of its failure to comply with the standards set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 17 (1966) since the District Court's conclusion of non-obviousness was based entirely upon the secondary considerations of long-felt but unsolved needs, commercial success and the like. (400 F.2d at page 41).

[377] *Second:* The Court of Appeals did "not have the benefit of a complete determination of the difference between the prior art and the patent in suit or of any findings concerning the level of skill in the pertinent art." (400 F.2d at page 42).

Third: Since "the District Court found three considerations dispositive of the issue of obviousness: (1) the presumption of validity of a patent; (2) the commercial success of the basic oxygen process; and (3) secondary considerations concerning prior attempts and failures at refining steel with oxygen", "under the facts of this case, neither commercial success nor the presumption of validity will support a finding of non-obviousness." (400 F.2d at page 42).

Fourth: One of the most pertinent prior art patents, the Schwarz patent, was not cited as a reference by the Patent Office, and so far as the record indicates, was not considered by the Patent Office. (400 F.2d at page 43).

Fifth: The Schwarz patent does not teach agitation of the bath by the oxygen stream; so that claim probably would not have distinguished the Schwarz patent *if* it had been before the Patent Office. (400 F.2d at page 43).

[378] *Sixth:* The creation of a licensing structure known as BOT negatives any favorable inference that might ordinarily arise in favor of the applicants. (400 F.2d at page 43).

Seventh: Any problems which might have been involved in deep blowing had existed for a relatively short period of time prior to the 1949 Linz experiments since, other than the Gerlafingen experiments, the record does not disclose any extensive attempts and failures to refine steel by deep blowing of oxygen between 1946 and 1949. (400 F.2d at page 44).

Eighth: Whether the success of the process is attributable to the disclosure of the Suess patent is unclear, because of the arrangements providing for the exchange of know-how and engineering knowledge between the various competitors. (400 F.2d at page 44).

Ninth: The elimination of several potential competitors of the patentees "negates any inference of extensive experimentation and failures by others skilled in the art." (400 F.2d at page 45).

Tenth: The District Court's conclusion that the Schwarz and Miles patents were inoperable did not have much relevance on the issue of obviousness because the District

Court **[379]** *assumed* that "maintenance of a fluid slag was inconsistent with deep penetration as taught by Schwarz and Miles," and so inter-related this with phosphorus removal, fluid slag, and depth of penetration as such related to the "issue [of] . . . obviousness". (400 F.2d at page 45).

Eleventh: Because the continuation-in-part application was not filed until 1955 " . . . the patentees had the benefit of almost six years of experience in using the basic oxygen process plus whatever information they might have obtained through the BOT arrangement." (400 F.2d at page 45).

Twelfth: The Miles patent contained no specific teaching of deep penetration "but the District Court *implied* such a teaching from the recommendation that the gas should be jetted at a supersonic speed". (Emphasis added) (400 F.2d at page 46).

Thirteenth: The District Court held that "In sum, the only difference between the Suess disclosure and the prior art is the teaching of avoidance of deep penetration as opposed to deep penetration". (400 F.2d at page 46).

Fourteenth: The District Court "should have determined what the prior art taught concerning the necessity of a fluid slag, the method of obtaining a fluid slag, and the feasibility of the suggested method", but the District Court failed to take **[380]** this further step of concisely defining the difference between the depth of penetration taught by Suess and the limitation on depth of penetration as "clearly defined" by Schwarz and Miles. (400 F. 2d at page 47).

Fifteenth: The claim of the Suess patent does not describe the concept of "avoidance of deep penetration" as the subject matter of the invention and does not distingish it from the prior art, presumably because "it

becomes almost impossible to distinguish 'deep penetration' as taught by the patentees." (400 F.2d at page 48).

Sixteenth: Because the plaintiffs have insisted throughout this case that they regard the *subject matter* of the patentees' invention to be 'avoidance of deep penetration', (400 F.2d at page 49) which is not contained in the claims, the plaintiffs' attempted incorporation of that reference into the term " • • • to an extent to avoid material agitation of the bath by the oxygen stream • • • and to the phrase ' • • • contract of the oxygen with the bath resulting in • • • localized reaction zone spaced a substantial distance from the refractory lining • • • ' . . . can be interpreted as limiting the penetration of the oxygen stream to a 'practically negligible' penetration." (400 F.2d at page 50).

[381] *Seventeenth:* Even though "Conflicts in the evidence, . . . best entrusted to the District Court in the first instance . . ." were not made in this case as related to disclosures of the Miles patent on the question of obviousness "the case need not be remanded for further findings because the District Court can be affirmed on another ground." (400 F.2d at page 48).

Eighteenth: The patentees assumed inconsistent positioning before the patent office and so ". . . the patentees failed to define their alleged advance over the prior art and that in failing to properly limit their claims they attempted to extend their monopoly to something already patented." (400 F.2d at page 51).

Nineteenth: The patentees in the face of prior claim rejections by the Patent Office's inference of abandonment can be drawn from omission of "avoidance of deep penetration" and thus cannot regain the phrase or qualify the effect of their acquiesence through the affidavits because of the file wrapper estoppel. (400 F.2d at pages 54-55).

Again I say that it is not for me to criticize in this most difficult assignment, but it is my obligation to ascertain whether either or both opinions indicate that this was one of those rare occasions in which misunderstanding of technical **[382]** facts and issues occurred. It is for this reason and this reason only that I inquire into what may have been a difference of thinking on the part of the Appeals Court from that of the District Court as indicated in the first place by the opinions themselves, and as these refer to the record for their supports.

Since the holdings in the Opinion of the Court of Appeals, as in the case in the District Court Opinion, necessarily overlap and become cumulative, I shall endeavor to separate these and to discuss them in orderly fashion and also avoid all possible repetition.

First: The finding by the Court of Appeals (a) that the District Court's conclusion of non-obviousness was based entirely upon secondary considerations of long-felt but unsolved needs, commercial success and the like, I refer to Oxygen Compendium XVII where it was obvious that not only Durrer and Hellbruegge at Gerlafingen were experimenting, but that Schwarz, the first patentee and the John Miles & Partner Co., in England were engaged in considerable experimentation. Here we are also informed of the experimentation going on in the United States and of the building, both in the United States and in Europe, of oxygen plants and of the cheap oxygen in Germany, where nitrogen was being produced as a fertilizer and oxygen as a **[383]** by-product. We are told of the list of 30 named experimenters and even more unnamed experimenters in the McLouth Record, PX-308. Whether or not these indicated a long-felt need may be questionable, but that it was an unsolved "need" is unquestionable; (b) as for the commercial success, Drs. Durrer and Hauttmann testified, without contradiction by the defendant McLouth, not only the Gerlafingen test results

but also those of Schwarz and Miles, did not produce commercial quality products.

However, as the Court of Appeals stated these were secondary considerations, but as secondary considerations they would be considered under *Graham* v. *John Deere Co., supra,* only where non-obviousness became an issue of fact. I must, therefore, inquire into these opinions on what was produced as evidence which would support the defense of obviousness, keeping in mind that the burden is upon the defendant to overcome the statutory directive that when issued, a patent is presumed to be valid but such presumption is overcome by clear and convincing evidence. *Oliver United Filters, Inc.* v. *Silver,* 206 F.2d 658, C.A. 10, 1953, cert. den. 346 U.S. 923; *Consolidated Water Power & Paper Co.* v. *Kimberly-Clark Corp.,* 107 F. Supp. 777 (D.C. Wis., 1952), aff'd. 204 F.2d 573, C.A. 7, 1953.

[384] *Second*: As for the holding by the Court of Appeals that it did "not have the benefit of a complete determination of the difference between the prior art and the patent in suit or of any findings concerning the level of skill in the pertinent art", as for the "difference between the prior art and the patent in suit", the McLouth District Court found that " . . . there is admittedly no evidence that steel with satisfactory phosphorus and sulfur content was made commercially by anyone in the 1940's using the oxygen blowing process (R. 13484-13486), despite extensive experimentation by a number of men in several countries of Europe. Such experimentation included a series of tests conducted in Gerlafingen, Switzerland by Dr. Durrer and Dr. Henrick Hellbruegge in 1948 and the Spring of 1949, blowing pure oxygen downward into a bath of molten pig iron, using an afterblow to remove phosphorus after carbon had been removed in the main blow. (DX 61; R. 4915). These tests produced steel satisfactory for some purposes despite "refractory dam-

age and an objectionably high phosphorus content in the steel produced (R. 11929)." (257 F.Supp. at page 379).

The District Court Opinion then contains this

> "For example, when asked by the Court on final arguments: 'Do you concede that the Schwarz and Miles patent would be the most pertinent prior art?', **[385]** counsel for the defendant replied: 'Certainly the most pertinent patents, yes, your Honor, very much. They are the ones on which we primarily rely.' " (257 F.Supp. at page 387).

The Opinion thereafter recites that the defendant's witness Dr. Durrer testified that the Schwarz patent contained his own ideas

> ". . . yet Dr. Durrer himself required further experimentation with oxygen blowing in Gerlafingen, Switzerland in 1948 and 1949, and even with such experimentation, he did not make steel comparable to that made in Linz by the patentees starting in June 1949 . . . The patentees tried to follow the teachings of Schwarz and Durrer in a series of tests starting in June 17, 1949, but failed to get good results, requiring further experimentation in a series of tests starting June 25, 1949, to get satisfactory phosphorus removal without refractory damage." (257 F.Supp. at page 388).

The Opinion also states that there is considerable evidence in the record that the teachings of the Schwarz patent cannot in fact lead to good results in steelmaking "because the early fluid slag required for satisfactory phosphorus removal according to the specification of the Suess patent in suit is not achieved, with deep penetration of the bath by the jet, as taught by Schwarz." (257 F.Supp. at page 388).

At another time the District Court's Opinion says

> "Schwarz teaches nothing about the avoidance of material agitation of the bath by the oxygen stream

> or a circulation of the bath produced by chemical **[386]** reactions in a localized reaction zone, as claimed by the patent in suit." (257 F.Supp. at pages 390-391).

Further on, the McLouth District Court Opinion recites the differences in the Miles patent and the patent in suit (257 F.Supp. at pages 391-393). It afterwards follows through with a distinction between the Potts patent as against that of the patent in suit (257 F.Supp. at pages 393-394). Afterwards it detailed distinctions or differences between the prior art of Schwarz and Miles and that of the patent in suit (257 F.Supp. at pages 397-398). The Opinion thereafter differentiates with considerable detail and charts the prior art products at Gerlafingen which practiced the prior art of Schwarz as against chemical content at Linz in both the June 17th and June 25th tests, (257 F.Supp. at pages 410-415), and as it produced high quality steel while preserving the refractory life in the vessel.

As for the level of skill in the pertinent art, the District Court Opinion contains considerable references. Earlier the Opinion stated that a defendant's witness ". . . Dr. Flinn admitted that the Schwarz patent, unlike the patent in suit, does not teach specific operating conditions." (257 F.Supp. at page 388). In a footnote at page 386, the District Court found that the defendant admits that the process **[387]** disclosed in the Suess specification is the same as the process in use at the Linz, Austria plants, and that the Linz process is essentially the same as the process in use at the McLouth plant in Trention, Michigan. (257 F.Supp. at page 386).

As relates to the Linz Suess process, the District Court's Opinion refers to one of the defendant's witnesses in this excerpt

> " 'Q. And if you follow those specific teachings, you get good steel; right?
>
> A. Yes.' (R. 7924)" (257 F.Supp. at page 420).

Reference is then made to another McLouth witness, Mr. Johnson who "apparently encountered no difficulty in going from the heat used in the OP-1 shop [at McLouth] to the larger heat used in the OP-2 operation." (257 F. Supp. at page 421).

The District Court Opinion found "In short, according to defendant's own testimony, persons skilled in the art can make satisfactory steel following the teachings of the 36-ton heat example given in the specification, and a person skilled in the art can apparently extrapolate from such conditions to determine the operating conditions for larger heat sizes." (257 F.Supp. at page 422).

In any event, the burden was on the defendant McLouth to prove by appropriate evidence that the necessary skill **[388]** was not taught in the Suess specification. It failed to do this as was found by the District Court as follows:

> "In sum, the Court finds that the specification of the patent in suit, despite certain indefinite, and inaccuracies, nevertheless complied with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and use the same.' At least defendant has not sustained its burden of proving otherwise, especially in light of defendant's own testimony that persons skilled in the art could make satisfactory steel following the teachings of the example and that extrapolation to other heat sizes was a simple matter." (257 F.Supp. at page 424).

Third: The holding of the Court of Appeals that "the District Court found three considerations dispositive of the issue of obviousness: (1) presumption of validity of the patent; (2) the commercial success of the basic oxygen process; and (3) secondary considerations concerning prior attempts and failures at refining steel with oxygen"; and that "Under the facts of this case", the District Court could not do this because neither commercial success nor presumption of validity will support a finding

of non-obviousness. While it would not ordinarily be appropriate to inquire into the legal principles as stated, it does become an equitable matter, since the legal principles are coupled with "Under the facts of this case". Under ordinary circumstances, one could not **[389]** disagree with the Appeals Court in saying that commercial success is not evidence of validity of a patent, or that commercial success is not even proof of an invention. *Continental Can Co.* v. *Crown Cork & Seal Co.*, 415 F.2d 601, C.A. 3, 1969 cert. den. 397 U.S. 914; *Copease Manufacturing Co.* v. *Cormac Photocopy Corp.*, 242 F. Supp. 993 (D.C.N.Y., 1965).

Relating to "commercial success of the basic oxygen process", I assume that this relates to what the Court of Appeals referred to as McLouth's contention that the "lapse" in commercial use of the Schwarz refining process "was due to the unavailability of a method for producing oxygen cheaply in commercial quantities." I shall deal with each of these separately, as they relate to "the facts of this case."

Section 282 of the patent statute, 35 U.S.C. § 1 et seq., provides as follows:

> "A patent shall be presumed valid. The burden of establishing invalidity of a patent shall rest on a party asserting it.
>
> The following shall be defenses in any action involving the validity or infringement of a patent and shall be pleaded:
>
> (1) Noninfringement, absence of liability for infringeement or unenforceability,
>
> (2) Invalidity of the patent or any claim in suit on any ground specified in part II of this title as a condition for patentability,
>
> **[390]** (3) Invalidity of the patent or any claim in suit for failure to comply with any requirement of sections 112 or 251 of this title,

(4) Any other fact or act made a defense by this title."

In the words of the Supreme Court, the presumption of validity is not conclusive, but it gives the grant of a patent patent substance and value. *Westinghouse Electric & Manufacturing Co.* v. *Formica Insulation Co.,* 266 U.S. 342 (1924).

When the Patent Office issues a patent, it is clothed with the presumption of validity. *Associated Plastics Company* v. *Gids Molding Corp.,* 182 F.2d 100, C.A. 7, 1950. The very issuance of letters patent is prima facie evidence of validity. *Thiberg* v. *Bach,* 107 F.Supp. 639, aff'd. 203 F.2d 956, C.A. 3, 1952.

Oxygen Availability

The Court of Appeals recognized and accepted the District Court's inability to determine when commercial quanties of oxygen . . . would explain the absence of any prior attempts to apply the Schwarz and Miles patents . . . and would thus weaken any inferences as such a lapse in the industry might raise on **[391]** on the issue of obviousness." (400 F.2d at page 42).

Under Oxygen Availability XVII, I discussed the evidence in the McLouth transcript where the defendant's witnesses Dr. Durrer and Dr. Hellbruegge had been working on the application of oxygen upon an industrial scale before 1941 (R.4514). I also said that the defendant's Vice President in charge of Engineering at McLouth, Lyle J. Johnson, stated (R.3443): That there were a number of oxygen tonnage plants constructed which would have been "suitable for this type of usage". The usage referred to was the application to industrial conversion of iron into steel by the use of this process. I said at that time that there was actually no disputed evidence upon which the District Court could have failed to find that there was adequate tonnage oxygen production for industrial usage from approximately 1940-1941. I additionally set forth the fact that one plant in Germany, Sudeutsche Kalkstickstoff Werke, Trostberg, in Eastern Bavaria, had itself up for manufacturing of nitrogen from the air in accordance with the Linde-Fraenkl process; that it had an overabundance of oxygen as a by-product which the German Government Board attempted to use for a low shaft blast furnace using a high concentration of oxygen. I referred to the fact that Dr. Hellbruegge **[392]** testified in this regard (R. 4521); that he and Professor Durrer went to Trostberg in upper Bavaria, where a large low shaft furnace had been built for the production of ferro alloys and that they had available at their disposal, 6000 cubic meters of oxygen per hour. He said that these tests came to a halt on towards the end of the war in the spring of 1945. He said (R.4739) that the work at Trostberg had nothing to do with the refining of pig iron into steel. He later said (R.4745) that the oxygen plant had been used for military purposes in the latter part of 1944, and while he did not know how long that plant had been there, he thought it was "far beyond ten years".

Dr. Durrer also spoke of this (R.5067-8-9) at Gute Hoffnungs Huette and that oxygen enriched air was being used in a low shaft furnace. He had met with Dr. Katwat and Mr. Fraenkl as early as 1929 with relation to this work. I related to the two papers by Dr. Schwarz, included in the record of the case; one in 1949 on a report from Radix Runsheau on the present state of development of oxygen refinings in Sieman-Martin and electric furnaces (DX 182A), and the second, of a report of the steel plant committee of the Association of German Iron and Steelmakers in Genoa, entitled "Blowing of Basic Bessemer **[393]** Pig Iron with a free jet lance", and this was made in 1952 (DX183E). While a discussion had been had in the second paper on the cost of oxygen, Dr. Schwarz did not make any statement that oxygen was not available at an

economically favorable cost, other than the statement that the bottled oxygen of Linde-Fraenkl would be costly at $40.70 as against the $8.82 per ton cost of oxygen by the installation at the Weirton Steel Company at Weirton, West Virginia. These two papers relate, on the whole to, oxygen experimentation.

Although the evidence in the record abundantly shows that oxygen was available for the purpose, there was no evidence that efforts were made to industrialize the Schwarz process application of iron to steel, during the years 1940 through 1952, after the issuance of the Suess patent. I commented there that nowhere was there any complaint that oxygen was unavailable on a tonage basis by the construction of a plant at the site where it was to be used for refining of iron. Supplementally, I presented a number of publications presented to me by the parties in this case which showed these circumstances to be factual. Thus, the scientific facts of the case would not support the Court of Appeals second objection to the question of obviousness that prior patentees who had the commercially successful basic oxygen process, such as Schwarz **[394]** and later Miles, could not have acquired tonnage oxygen for its industrialization in the making of direct refinement of iron into steel.

This then brings us to the consideration of prior attempts and failures at refining steel with oxygen. Again, I refer to that portion of this Opinion entitled Oxygen Compendium XVII, page 360 where the McLouth record is cited to show that there had been at least 30 individuals, who were steel experts including the patentees, Schwarz, Miles and the later experimenters, Durrer and Hellbruegge, Linde and others, and who were engaged in experimentation to find a "remedy or a resolution" of their problems of applying oxygen directly to molten iron and producing an industrially acceptable steel while at the same time avoiding the destruction of the refractories.

Schwarz Prior Art Consideration by Patent Office

Fourth: A patent is presumed valid (35 U.S.C. § 282); however, such a presumption is weakened when the prior art is not considered. *Walden, Inc.* v. *Alexander Mfg. Co.*, 423 F.2d 91, C.A. 5, 1970; *American Seating Co.* v. *Southeastern Metals Co.*, 412 F.2d 756, C.A. 5, 1969. On this premise, the McLouth Court of Appeals found that the failure of the Patent Office **[395]** to cite the Schwarz Patent significantly weakened the presumption of validity. (400 F.2d at page 43).

It said:

> ". . . the Schwarz patent, was not cited as a reference by the Patent Office and, so far as the record indicated was not considered by the Patent Office." (400 F.2d at page 43).

Even though it has been previously discussed, repetition is here warranted that the Schwarz patent was discussed in the Patent Office conferences.

In a footnote accompanying this conclusion (400 F.2d at page 43), the Court of Appeals admitted that there was "mention of the Schwarz patent in the file wrapper [as] contained in the affidavits of Rinesch and Hauttmann," but it said "These affidavits were submitted only about two weeks before the issuance of the patent, and the record does not indicate what, if any, consideration the patent office gave to the affidavits. Such an off-hand reference does not amount to patent office consideration ofthe prior art patent."

Later in the Opinion, the Court of Appeals in discussing another phase considered these affidavits so filed in the Patent Office as something secretly hidden away in these words.

> "Through affidavits submitted to the Patent Office and filed somewhere obscurely in the file wrapper history of the patent" (400 F.2d at page 50).

[396] Taking this last comment first, the patent office in its promulgated rules has provided in 37 C.F.R. § 1.2 that all business with the patent office should be transacted in writing because "No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt." Thus the filing of the Hauttmann and Rinesch affidavits by the Suess applicants became a part of the file wrapper history, and as such part of the file wrapper history became as much a part of the record as the continuation-in-part application itself.

Authorization for filing affidavits in cases is provided by two rules, Section 1.131, 37 C.F.R. and Rule Section 1.132, 37 C.F.R. The affidavits, being a part of the file wrapper history are, as the whole wrapper history, held confidential until a final determination is made of the matter, when they become available for public scrutiny. Therefore, the affidavits, as well as the continuation-in-part application and every other section of the file wrapper history were in the same category of treatment, and as such should not be considered judicially as "submitted to the Patent Office and filed somewhere obscurely in the history of the patent."

While Section 1.2 states that it is unnecessary for **[397]** applicants or their representatives to appear in the patent office, applicants are put on notice that unless the action of the patent office is a part of the written record "No attention will be paid to any alleged oral promise, stipulation or understanding in relation to which there is disagreement or doubt." But that does not deny the applicants the right to interviews with examiners, Rather Rule Section 1.133 (37 C.F.R.) specifically provides for interviews as authorized "in the examiners' room at such times, within office hours, as the respective examiner may designate" and "should be arranged for in advance". That such interviews are a customary and usual procedure in the patent office was testified to before me by former patent commissioners. Cases relating to particularly when file wrapper estoppel exists or does not exist show that these interviews, or as they are frequently called by the courts "negotiations", are in effect a way of life in patent application procedure.

Van der Horst Corp. v. *Chromium Corp.*, 98 F.Supp. 412, 420 (S.D.N.Y.-1951); aff'd. 197 F.2d 791, C.A. 2, 1952.

Texas Co. v. *Anderson-Prichard Refining Corp.*, 122 F.2d 829, (CAID-1941).

Westinghouse Electric Corp. v. *Hanover Chemicals Mfg. Co.*, 179 F.2d 293 (CA3-1949).

However, the file wrapper history in this case is not devoid of a recording that (PX2A, at page 74):

[398] "The claims of the application are cancelled and new claims 17 and 1 are substituted therefor in view of the discussion with the Examiner on May 1, 1957.

The new claims are presented in view of information recently made available and which indicate that the instant application discloses a fundamentally different approach to the refining of pig iron or crude iron by means of substantially pure oxygen and was suggested heretofore. The new claims are believed to be properly definitive of the invention."

In this recording contained in the file wrapper history there is a reference to Schwarz (PX2A, at pages 74-75) as follows:

"The applicants, as early as June, 1949, were familiar with methods of refining crude iron or pig iron proposed by the patentees of the Miles et al. French Patent No. 933,098 and the Schwartz German Patent No. 735,196. The applicants assumed that the Schwartz and Miles et al. methods were suitable for the production of steel of commercial quality and the applicants attempted to use these methods in their early work."

It goes on to state that following the processes outlined by these prior patents that:

> "The early work with these operating conditions was a complete failure because the quality of the steel (if it could be called steel), was very poor and the reaction resulted in rapid destruction of the refractory lining of the converter in which the blowing operations were conducted."

Thereafter the file wrapper history (at page 75) describes the Suess applicants' scientific theory that their process **[399]** brought about a high temperature reaction zone at the central surface of the molten metal bath, when the oxygen impinged upon the metal, under such circumstances as was instructed in the specification.

The file wrapper history then relates the fact that Rudolph Rinesch submitted with a declaration an affidavit supporting the applicants' declaration; and there is contained evidence that this affidavit was considered. This statement was made (PX2A, at page 76):

> "It should be noted that test No. Br 13 is obviously erroneous in specifying a phosphorous content of 0.96% and was not relied on in the affidavit."

It then goes on to say that an explanation of the obviously high P value was requested of the applicants and a cablegram was received as was stated in the file wrapper history.

The file wrapper history continues (PX2A, at page 76) that "A corroborating affidavit by Hubert Hauttmann is enclosed also" and proceeds to discuss the contents of the affidavit as it relates to new claims 17 and 18 as they "properly define the invention and are of a scope commensurate with the invention". It continues to say (at page 77):

[400] "Claim 17, the only independent claim, brings out quite clearly the fact that the stream of oxygen

> is discharged vertically downwardly against the surface of the bath without material agitation of the bath by the oxygen stream and that contact of the oxygen with the bath results in a reaction in a localized reaction zone spaced a substantial distance from the refractory lining of the vessel containing the molten iron. Further, the claim asserts that these new conditions result in the refining of the iron and gas evolution and the production of high temperature in the reaction zone *away from the refractory lining*. The reaction in the reaction zone produces a circulatory movement in the molten metal which brings those portions of the molten metal bath remote from the reaction zone into the reaction zone to refine those portions with minimum injury to the refractory lining."

I need only state here that the very fact that it is recorded in the file wrapper history must have been done with the full knowledge of the Examiner. The Court of Appeals stated (in its footnote 6) (400 F.2d at page 43), that two affidavits of two applicants were filed for consideration by the Patent Office with the continuation-in-part application. In the Rinesch affidavit filed in the Patent Office on June 11, 1957 (PX2A, at pages 78-84), it was stated:

> "I and Messrs. Suess, Hauttmann and Trenkler started our experimental work on manufacturing steel from crude iron by blowing pure oxygen on the surface of melted crude iron in June, 1949. At that time, we were aware of the state of technology as reflected in the methods now described in German Patent No. 735,196 to Schwarz and French patent No. 933,098 to Miles et al.

[401] The two above-mentioned patents disclose blowing oxygen into a bath of melted crude iron from above providing the oxygen jet with sufficient energy to cause it to penetrate deeply into the bath. The patentees intended to cause the reaction of the oxygen with the crude iron to take place within the bath. Information is not given in the patents about the composition of the crude iron or the analysis of the converted steel, or durability of the refractory lining

of the converter and such information was not available to me and Messrs. Suess, Hauttmann and Trenkler at the beginning of our work."

Then at page 82, this was stated:

"The success of our experiments grew of a departure from the methods disclosed in the Schwarz and Miles et al. patents, which were developed for Brassert & Company while the patentees were employed by that company. I know that attempts were made to manufacture steel in accordance with the patented methods in Italy and that such attempts were not successful."

And finally, (at page 84),

"Inasmuch as our concept of avoiding deep penetration of the molten metal with the oxygen blast is just the opposite of the methods disclosed in the Schwarz and Miles et al. patents and constitutes a major technical advance in the manufacture of steel from crude iron, I believe that our method is patentable."

In the Hauttmann affidavit Page 2, at page 89 of PX-2A, this is said:

(at line 4) . . . "The technological conditions as expressed in the Schwarz German patent No. 735,196 and Miles French patent No. 933,098 which make conversions of crude iron to steel conditional upon the deep penetration of the oxygen stream into the bath, were known to me prior to 1949. **[402]** The patentees intended the oxygen to be carried to all parts of the bath by the agitation or stirring produced by the deep penetration of the bath by the oxygen jet. Thereby the reaction of the oxygen with the crude iron was intended to take place within and throughout the bath by the oxygen seeking out the impurities."

(at line 23) . . . ". . . Messrs. Suess, Rinesch, Trenkler and I started our work in 1949 on the development of a method of refining crude iron with oxygen by utilizing the conditions suggested by Schwarz and Miles."

From page 5 (page 92 of PX-2-A) in the last paragraph:

"Inasmuch as our concepts of securing purification of the entire contents of the bath mainly by the controlled circulation induced by the reaction center is just the opposite of trying to carry the oxygen to all parts of the bath by agitation produced by deep penetration, as by the methods disclosed in the Schwarz and Miles patents, and constitutes a major technical advance in the commercial manufacture of steel from crude iron, I believe that our method is patentable."

So that while the file wrapper history states that interviews and affidavits clarified the matter before the Examiner, it follows through with many of the details which were contained in the written portion of the affidavits. However, the Court of Appeals considered this as a "void" in the record in these words:

"Although the record is void as to the content of the discussion with the examiner on May 1, 1957, we believe that an inference of abandonment **[403]** can be drawn from the omission of 'avoidance of deep penetration' from the final claims." (400 F.2d at page 54).

The difficulty with this statement is that there actually is no "void", even if there is no detailed and minute recording of the interview or "negotiation" between the Primary Examiner and the applicants or their representative. As for the conclusion that "abandonment can be drawn from the omission of 'avoidance of deep penertation' from the final claims", this could not be accurate because at no place in the prior claims did the applicants present an element or factor that comprised or composed the subject matter which stated that "avoidance of deep penetration" was either "the gist of the invention" or an element or factor of the subject matter. The patent particularized the elements or factors as they were contained in the instructions of the specification, and stated that if followed, these would bring results, "while" or "under

such conditions as to '' or ''related to'' avoidance of deep penetration.

In any event, the file wrapper history did reveal for the information not only of the District Court, but also of the Court of Appeals (PX2A, pages 74-75) that the applicants clearly stated to the Patent Office that ''the applicants assumed **[404]** that Schwarz and Miles et al. methods were suitable for the production of steel of commercial quality and the applicants attempted to use these methods in their early work . . . The early work with these operating conditions was a complete failure because the quality of the steel . . . was very poor and the reaction resulted in rapid destruction of the refractory lining of the converter in which the blowing operations were conducted.'' Thus the patent procedure contained in the file wrapper history shows (as was partially admitted by the Court of Appeals—see footnote, 400 F.2d at page 43) that the prior art of Schwarz patent was considered in the Patent Office, and that with this consideration of Claims 17 and 18, renumbered Claims 1 and 2, were allowed.

Under these circumstances, I believe that technical aspects of the patent were misconceived by the Court of Appeals through its belief that the affidavits filed with the file wrapper in the Patent Office were ''obscure'' or were a ''subterfuge'' on the part of the applicants in order to avoid a rejection, and therefore deserves no credibility.

Secondly, I am of the opinion that the Court of Appeals was misguided by the original findings of the District Court that ''reduction of impact pressure'' was the ''avoidance of deep **[405]** penetration [which] was the gist of the invention''. Thus, if the McLouth District Court did mistinterpret the specification itself and arrived at the conclusion that the specification stated that the oxygen jet physically or mechanically produced circulation in the molten bath, and, thereafter made its determination that

the adjustment of the oxygen jet was the invention because it brought about an intermediate impact by the avoidance of deep penetration of the bath as was practiced by prior art; and as such was the gist of the invention—if accepted and followed by the Court of Appeals, rather than as viewing this as the intermediate result of the instructions contained in the Suess specification and a further caution to the operator that if he followed the Suess instructions contained in the specification the results of the prior art particularly ''avoidance of deep penetration'' would be accomplished—then the original misinterpretation of the District Court would have become threaded into the thinking of the Court of Appeals and the technological comprehension of what was stated in the specification would inequitably result.

I have further proof before me that the indicated record was considered by the Patent Office as such evidence came from Claude A. LeRoy, the Primary Examiner, himself. I need **[406]** not state all that the Primary Examiner said, but I shall repeat what he stated (PX1002, as introduced at the Post Trial Hearing, at pages 7-8):

> ''Q. Did you suggest any language for the claims for the application which you regarded as positive or more positive language?
>
> A. Yes. I thought that the language should try to bring out that the oxygen stream was confined or localized in the area somewhere near the surface of the bath. The deep language, the deep penetration, I thought, was well known in the art. It is a special peneration into the bath, but if you wanted to define this as being localized, I didn't like the language of 'avoid deep penetration.'
>
> So, I suggested that they use something to to show it was localized in that area and I have

> forgotten now what that exact language was. I don't know right now. *I have to refer to the claim.*" (Emphasis added).

The above testimony is given credibility from its source. Although I recognize that Rule 1.2 of the Patent Office requires all correspondence to be in writing, I also recognize that Mr. LeRoy was not testifying from a self serving capacity, a situation for which the rule was evidently promulgated. Rather, as an ex-employee of the Patent Office, he was providing the oral history from the view of that agency.

Neither the District Court nor the Court of Appeals had any help from a record supplement such as I had from the **[407]** testimony of the Patent Office witness in the post-trial hearing before me on April 29, 1970 (FWE at pages 25-26), that the Schwarz patent was discussed with the Primary Examiner and considered at that time.

Fifth: As for the holding by the Court of Appeals that the Schwarz patent does not teach agitation of the bath by the oxygen stream, I refer to Compendium X "Avoidance of Material Agitation" at page 8 where I said,

> "While the Schwarz patent does not use either words 'circulate' or 'agitate' the metal bath, its more limited and fewer instructions, it will be seem, are more or less like those of the later Miles patent in that both advocate the introduction of the oxidizing agent or fuel into the interior of the bath."

I referred to the Schwarz direction for introducing the jet of gas "with such a high kinetic energy that it is capable of penetrating, in the manner of a solid body, deep into the bath . . ."

But while the Schwarz patent did not in so many words say that the oxygen stream was to be used to agitate the bath, it did teach agitation of the bath by the oxygen

stream by its insertion or injection into the bath "in the manner of a solid body".

In a footnote I indicated that a "solid body" would indicate a huge spoon or other device for manipulating the **[408]** "agitating" or "stirring" of the bath. I quoted Miles as saying that (Id. at page 11) "The jet serves to circulate and agitate the metal and the slag . . ."

Sixth: The Court of Appeals found that there could be no competitive action on industrial functioning on the Schwarz patent because VOEST had tied all of the steel companies into an association known as BOT. The record indicates that while the steel companies in England and in Europe, as well as in the United States, were experimenting with oxygen application to iron processing, none of them had perfected its use for processing on an industrial scale or level.

A series of letters in evidence indicated certain understandings among the parties and who the parties were. Thus in a letter dated June 6, 1949 (DX86-E), from General Management of "Osterreichisch-Alpine Montangesellschaft to Dr. Durrer, it was stated that

> "It was decided among representatives of Rollsche Eisenwerke, Gerlafingen, Mannesmannwerke Huckingen, Vereinigte Osterreichische Eisen-und Stahlwerke AG, Linz, and Osterreichische-Alpine Montangesellschaft Vienna, that a mutual exchage of experience in the field of the metallurgical use of oxygen should take place."

This letter then referred to "the use of oxygen in iron and steel plants, such as coke blast furnaces, electric blast **[409]** furnaces, in melting processes involving converters, open-hearth furnaces and electric furnaces as well as in other metallurgical processes." The four quoted companies were to make their experiences and ideas available to each other free of charge.

In a VOEST memorandum dated May 23, 1949 (DX82-E), it was said that:

> "In conferences in Leoben from May 19 to 21, 1949, it was decided to undertake a mutual study of the question of Oxygen Blowing in iron works by the Von Roll'sche Iron Works Gerlafingen, Huettenwerk Huckingen, Ag., Alpine Montangesellschaft Donawitz and VOEST Linz."

The procedure was outlined in five points:

1. All experience and know-how to be at the disposal of the plants, reciprocally.

2. The tests were to be carried out and financed by the individual plants which conducted them, with certain exceptions which are here irrelevant.

3. Another conference was to take place in four to five weeks in Linz.

4. Future tests would be begun in Huckingen and in Linz with the blowing of pure oxygen in converters or vessels suitable for that process.

5. Dr. Durrer was to act as secretary.

Thus, so far as the record is concerned, each of the participating experimenters continued to operate in their **[410]** steel industrial plants independently of and apparently competitively with VOEST and each other. In fact we are informed that there was competition within VOEST itself, when Dr. Suess filed an application for a patent in his individual benefit in the summer of 1949 in Germany, concerning which there was litigation in the German Courts.

In a file Memorandum (PX301B) from Gerlafingen dated June 9, 1949, a discussion on oxygen joint work was related as it took place at the Hotel Krone, Solothurn by Managers of the Huttenwerk Huckingen, Dr. Durrer, Manager Gengenbach, Doctor Spillman, Graduate Engineer Jenney and Doctor Hellbruegge, all stated that there had been mention of establishing joint collaboration in which Donawitz,

Linz, Huckingen and Von Roll plants would participate. Each was to make their know-how available without consideration and each plant was to pay by itself for the tests which each carried out, but the results of these experiments were to be made available to all parties.

In the "mentioning" there was a statement to the effect that patent applications were to be filed jointly, together with other circumstances. However, that question was left up in the air at that time.

[411] The participants signed a pledge to guarantee the confidential nature of matters seen and heard (PX-296B). In this memo the parties set up a work schedule which divided the different metallurgical problems to which the individual companies would turn their attention which were:

> Rollsche Eisenwerke was to take over tests involving oxygen refining in the electric furnace.
>
> Huettenwerk Huckingen was to carry out tests for refining Thomas steel with enriched air as well as with pure oxygen.
>
> Apline Montanges was to study utilization of manganese from manganese rich ores.
>
> Voest was to take over tests for producing steel with oxygen from various types of pig iron; the development of a usable vessel and the determination of the proper oxygen-content necessary for carrying out these processes would receive primary consideration.

On the same day, June 27, 1949, there was a Declaration made of the parties present at meetings held on June 26 and 27, 1949, (PX-295-B) in which they declared ". . . that they will neither disclose nor divulge anything outside of their plants concerning the information received or the findings made by themselves in the field of oxygen refining in the course of the meetings at Linz on June 26 and 27, 1949. They were also to use this information and findings within their own plants only in such a manner as to avoid their being passed on to the outside."

[412] On August 18, 1949, the patent situation on oxygen blowing was again discussed. Particularly the Brassert-Schwarz patent, the application of Ludwig von Roll'schen Eisenwerke, and the patent application A1279/49, Class 18B of Dr. Schwarz of Saltzberg "Method and Apparatus for the Continuous Refining of Pig Iron and Steel." It seems to have been concluded that this last would "have to be examined closely after it has been published for opposition since interference with our work can be expected therefrom."

Howver, the very fact that they had a loose agreement to turn over know-how and rights to the use of any discoveries made by any one of them did not prevent any one of them from building a factory, as did VOEST, and from utilizing the know-how of the Suess et al. patent.

But that does not dispose of the question that if Schwarz, particularly, and Miles had had a successful and utilizable patent or patents, as the case might have been, why any of these were prevented from building industrial plants and using oxygen as was advocated by Schwarz. The very fact that they did not do so, and the very fact that they were still experimenting as late as 1952, is some evidence of the fact that neither Schwarz nor Miles had a utilizable industrial instrumentality in their process of **[413]** applying oxygen as the refining agent of crude iron into steel.

While these factual consideration, as the District Court in McLouth stated, are secondary, they must be read in their factual settings as they may or may not aid a just and equitable determination of the questions before me.

In any event, while there were references to agreements on the sharing of know-how experience and rights to function under the discovery made by each of the participants, the record is devoid of commitments as would specifically amount to anti-competitive devices in the business world or to monopolies. These were no different than jointures

allowable by law for the accomplishment of projects cite *McRoberts* v. *Phelps*, 391 Pa. 591 (1950).

Seventh: As relates to the finding by the Court of Appeals that the record does not disclose any extensive attempts and failures to refine steel by deep blowing of oxygen between 1946 and 1949 (400 F.2d at page 44), since I have already discussed the circumstances that the McLouth record when closely examined reveal an abundance of attempts (and failures) to refine steel by deep blowing of oxygen between **[414]** 1946 and 1949; and particularly as was discussed in XVII, Oxygen, I see no further need to elaborate on this phase.

Eighth: As for the holding by the Court of Appeals, whether the success of the process is attributable to the disclosure of the Suess patent is unclear, because of the arrangement providing for the exchange of know-how and engineering knowledge between the various competitors (400 F.2d at page 44), I have already indicated variously, but particularly under Sixth here, that while the four members of the Konsortium had orally agreed to permit all their discoveries to be shared by their competitors, there was nevertheless a showing that, so far as the patent was concerned, there was considerable jealousy even among the participants at Linz itself. Furthermore, Dr. Durrer was not beneath showing his jealousy of the Suess accomplishment, and as against Schwarz with whom he said he had collaborated and that Schwarz had patented his idea in 1937. Dr. Durrer was the defendant McLouth's witness and presented testimony which was more favorable to the plaintiffs in that case.*

[415] The District Court, too, tied this testimony to Dr. Durrer that the Schwarz process was his idea (D.Ct. 257 F.Supp. at page 388) and that the Schwarz patent did not produce good steel (re. to D.C. 257 F.Supp. at page 388).

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* PX-J-16, pages 5100-5101.

In any event, let us assume here, *arguendo,* that the success of the Suess patent was unclear, such as to those who purchased its know-how, such as McLouth and the instant defendant J & L, they would nevertheless have had available to them the Schwarz and Miles patents. Nowhere in the record is there any showing of a rush by steelmakers to adopt the Schwarz and Miles process; while on the other hand, the McLouth record, particularly the District Court's opinion, shows an unmistakable rush by skeptical steelmakers to accept the Suess patent process. These are circumstances which eventually are some evidence, even if secondary, that the success of the process was attributable to the clear disclosure in the Suess patent on non-obviousness. In fact, it was so found by the District Court upon evidence of the McLouth witnesses who stated that they could follow the Suess process and could extrapolate it to higher tonnage furnaces. (257 F.Supp. at page 422).

[416] The McLouth evidence clearly presents a contrast between the non-acceptance of the Schwarz-Miles processes and the acceptance of the Suess process. This is not encumbered by any understandings which had been arrived at by the *Konsortium* of four steelmakers in Europe, particularly as these were involved in mutual jealousies.

I also discussed the reports of Dr. Schwarz in 1949 and 1952, in which he referred to the establishment at Linz of an oxygen steel manufacturing plant, and of the very fact that in these reports Dr. Schwarz, himself, showed no real enthusiastic conviction for his own patent.

Ninth: The Court of Appeal's finding that the elimination of potential competitors of the patentees "negates any inference of extensive experimentation and failures of others skilled in the art" (400 F.2d at page 45), is already fully discussed heretofore.

Tenth: The finding by the Court of Appeals that the District Court's conclusion that Schwarz and Miles patents

were inoperable did not have much relevance on the issue of obviousness because of the District Court's assumption that "maintenance of a fluid slag was inconsistent with deep penetration as taught by Schwarz and Miles"; and so the District Court interrelated this with phosphorus removal, fluid slag and depth of penetration as such related to the "issue of . . . obviousness." (400 F.2d at page 45).

[417] The McLouth record discloses an abundance of evidence that deep penetration of the oxygen jet into the bath produces iron oxides in the interior of the bath and the iron oxides produce high temperatures within the bath while the iron oxides lack contiguity with the slag for reaction of iron oxides in slag upon sulphur and phosphorus. The effort by Schwarz and Miles to produce the iron oxides within the bath served their purpose of saving iron and not lose it in the slag, but it prevented sufficient iron oxides to move into the slag for reaction with sulphur and phosphorus, and made the steel of poor quality because of sulphur and phosphorus content. That this prior art process did not save the refractories was, also a problem for solution by the prior art and the experimenters, until the Suess process solved it. This solution of the problem by Suess then was non-obvious to the prior art.

Since the prior art patents make it plainly obvious that the oxygen is to be injected into the bath and that by these methods of Schwarz and Miles the high temperature is created within the bath, and since there is an abundance of evidence in the record of McLouth that neither Schwarz nor Miles produced good steel because it contained these unwanted and unoxidized elements, it canot be said that the District Court "assumed"; rather the record discloses the technological chemical phenomena involved in these processes to have been **[418]** abundantly supportive of a finding that phosphorus removal, fluid slag and depth of penetration are interrelated and that this had not been obvious to the prior art of Schwarz, Miles and the Gerlafingen ex-

perimenters, because they practiced and preached deep penetration of oxygen into the bath.

Eleventh: The Court of Appeals held that the continuation-in-part application was not filed until 1955, and so ". . . the patentees had the benefit of almost six years' experience in using the basic oxygen process, plus whatever information they might have obtained through the BOT arrangement." (400 F.2d at page 45). As for the information received from BOT, I have already discussed that under this part and the record will disclose that the patentees obtained no benefits from the BOT arrangement, except prior thereto the advice of Dr. Durrer that he believed in the oxygen process and encouraged the Austrians to pursue experimentation in that direction.

It will be remembered that originally the Gerlafingen tests related to the Schwarz patent, was productive of no industrial steel and damaged the refractories. Thus it is obvious that the Suess patentees obtained no information "through the BOT arrangement."

As for the question of what benefits the patentees might have had during the almost six years of experience **[419]** between the filing of the original application in the United States patent office in 1951 and the continuation-in-part application in 1955, an examination of both of these will reveal that they are practically identical. Furthermore, an analysis of all of the claims which were filed indicates that what the claims revealed from the first through the eighteenth was the information which the applicants already had as of the 250th test in 1950. Undeniably then, the first application as it is re-incorporated in the continuation-in-part application has all the information in it that is necessary for a person skilled in the art of steelmaking to use and make the process. To constitute a continuous application, the second application must describe the same invention as the previous one. *E. I. DuPont de Nemours Co.* v. *Union Carbide Corp.*, 250 F.Supp. 816, 821 (N.D.Ill. 1966); rev. on other grounds 369 F.2d 242, 246 (C.A. 7-1966), cert. den. 386 U.S. 982 (1967).

Twelfth: The Court of Appeals held that even though the Miles patent contained no specific teaching of "deep penetration," yet the District Court "*implied* such a teaching from the recommendation that the gas should be jetted at a supersonic speed." (400 F.2d at page 46).

Semantically speaking, the Court of Appeals may be correct since the specific word "deep" is not contained in the Miles patent. However, the record of McLouth on both sides, as well **[420]** as the wording and arguments of counsel on both sides contain the expression "deep penetration" as being antithetical to Suess, thus labeling the prior art of Schwarz, Miles and the Gerlafingen experimenters. The original application filed by Suess and the continuation-in-part application filed later each contain the synonymous terminology about avoidance of "deep" penetration. Throughout the filed claims, which were either withdrawn or cancelled, from the beginning of the Suess application before the United States Patent Office, similar references to those contained in the patent specification relate to the resultant avoidance of "deep" penetration by the use of the Suess process. And when ultimately the McLouth District Court made its finding of invention it used the words "avoidance of *deep* penetration is the gist of the invention." (Emphasis added) (257 F.Supp at page 393, 408, 428). And this it did antithetically through its expressions that the parties agreed that "the gist of the prior art invention was deep penetration." Specifically, the District Court's words are:

> "The parties agree that the gist of the teachings of both Schwarz and Miles patents is the necessity of penetration *deep* into the bath by the oxygen jet." (Emphasis added) (257 Supp. 398).

Apparently then this was the customary thinking of the prior art as evidenced by the McLouth District Court. It

was reflected in the deposition of the Primary Examiner when **[421]** he referred to the prior art in these words (PX1002, at page 8):

> "The deep language, the deep penetration, I thought, was well known in the art."

He also said this (Id., at page 9-10):

> "It was well understood in the art that deep penetration means a considerable distance into the bath and they wanted to avoid that concept. So I tried to bring their—bring to their cognizance that it was a localized penetration, and so the language which we finally adopted there was to bring out that feature."

Semantically speaking then, the word "deep" is a relative term. In fact, we may consider that the word "deep" is relatively speaking the most superficial of the terminology of "deep, deeper and deepest." But the word "deep" itself does not mean "to the bottom of" or "to the utmost depth of a container or space." It has a specific meaning which is applicable to the contrasting relationship of the prior art and the later the non-deep Suess art.

Webster's New International Dictionary, 1971, at page 589 defines the word "deep," inter alia, as follows:

> "extending far or comparatively far from some level, edge surface or area: as . . . extending downward to a considerable degree . . .; extending well back from a surface accepted as front; having a specified extension in an implied direction usually downward . . ."

Deep is a simple antonym of shallow with especial connotation. That among the synonyms of profound and abysmal, "deep" is in general the less definite term. "Figuratively, therefore, deep applies to that which demands or gives penetration (as deep plots; deep knowledge) . . ." Webster's New Collegiate Dictionary, 1961, pages 215-216.

[422] With these facts and definitions in mind, we may understand that first of all Miles indicated that it was not easy to have the oxygen injected "within the bath," because as he stated the difficulty was that a large amount of the oxygen was lost in the process of attempting to inject it into the bath. It was for this reason that he instructed that injection be had by means of "an oxidizing fluid" and that this be done "at such speed that a sufficient portion of the fluid penetrates into the metal . . .". (PX10A, page 2, lines 5-9). He then stated that "The use of a liquid instead of a gas for the jet is that the liquid has a greater force of penetration into the metal" (Id., at page 2, lines 14-16). He thereafter said, that the high speeds "are desirable in order to obtain an optimum penetration and effect of the fluid, . . ." (Id. at page 3, lines 12-13). He explained that "The penetration of the jet also fulfills the useful function of agitating the bath . . ." (Id. page 4, lines 4-5). He also said "The jet is directed . . . at a velocity which is sufficiently high to assure the penetration of almost all the fluid into the bath. The jet serves to maintain a vigorous agitation so that the oxidizing reactions **[423]** follow one another *in the interior of the bath* at a very speed. . . ." (Id., at page 10, lines 3-7). And finally, he said "The jet serves *to circulate and agitate* the metal and the slag . . ." (Emphasis added) (Id. at page 18, lines 8-9). Schwarz suggested that the jet be introduced in the bath "in the manner of a solid body." In Claim 1 Miles used the words "A process for the refining of molten metal by the projecting of an oxidizing fluid into the metal at a velocity such that a sufficient proportion of the fluid penetrates into the metal . . ." (emphasis added) (Id. page 20, lines 3-5).

Speaking in homely fashion, when one wishes to stir a cup of tea or coffee, the teaspoon is used to "circulate and agitate" the contents. Even the more sophisticated household mix-master inserts the stirring blades sufficiently deep in the bath to "circulate and agitate" the mix for the cakes, etc. So, too, an ice cream maker has its circulating, agitat-

ing or stirring device, deeply enough into the container to produce its smoothness. A butter churn is another example. I think these explain what Miles, in desiring to have the metal bath "circulated and agitated," indicated that the oxidizing fluid had to enter and had to penetrate "deep" enough into the bath to produce such reactions. So it is that in deep penetration of the prior art, the iron is saved, but while the iron is saved, it is not permitted **[424]** to perform its function as iron oxide and entrap the sulphur and phosphorus and transfer them into the slag.

Here then I firmly believe is proof that it is dangerous for anyone contemplating the patent to either minimize or entirely disregard any of its component parts. There is no doubt that an individual practicing the teachings of Schwarz, Miles, Durrer or Hellbruegge would avoid slopping by penetrating deeply into the bath while he would be retaining more iron, but at the expense also of the retention of sulphur and phosphorus in the iron.

In contradistinction the Suess process permits the iron oxides to early flow into the slag as well as into the metal bath, and it does that by creating a pocket or indent which has been spoken of as the localized reaction zone at the top central surface of the bath, where the oxygen and metal make impingement contact, and where chemical oxidation or reaction occurs in accordance with the explanations contained in the Suess patent. In fact the specification explains how this is to be done and that when it is done, it

> ". . . produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat at a rate sufficient to provide the heat required for completion of the refining in a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, avoidance **[425]** of over oxidation (undue loss of iron to the slag), and avoidance of slopping. The process conducted under these conditions avoids a deep penetration of oxygen gas into the molten bath which seriously impairs refractory life at the bottom of the refining vessel." (PX1, col. 3, line 64 to col. 4, line 1) (See R. 819-821).

So it is that by reason of such impingement contact of oxygen to metal in the chemical oxidation reaction center at this place, the high temperatures are created and controlled, primarily, exothermically, as to permit the process to avoid slopping and the iron oxide to remain in proximity with both the slag and metal bath until the high temperatures diffuse it into the slag and also into the metal bath, where it dissipates its heat or high temperature into the bath as the secondary function within the bath and outside of the localized reaction or high temperature zone, endothermically, as the secondary part of the conversion process. This is actually the much overlooked key to the successful results of the Suess process.

The Appeals Court said,

> "*Assuming* that 'avoidance of deep penetration' defines some meaningful concept, the claim of the Suess Patent does not describe that concept as the subject matter of the invention and does not distinguish the alleged invention from the prior art." (Emphasis added) (400 F.2d at page 48).

The Appeals Court then went on to say,

> "Apparently the patentees were *aware* that, when it is once admitted that the oxygen jet penetrates into the bath to any not insubstantial degree, it becomes almost impossible to distinguish 'deep **[426]** penetration' as taught by Schwarz and Miles from 'avoidance of deep penetration' as taught by the patentees. The various patent applications on the L-D process reflect this difficulty." (Emphasis added) (400 F.2d at page 48).

Thereafter the Appeals Court cited instances: that when confronted by an interference by the Schwarz patent for a German patent, Dr. Suess replied,

> " 'In contradistinction to • • • Schwarz in the case of the present invention the molten bath is blown with so little kinetic energy that the oxygen does not penetrate. • • •'." (400 F.2d at page 48).

Again, Dr. Suess stated,

> " '• • • the oxygen is not blown into the molten bath, but rather onto the surface of the bath and reacts at the surface. • • • The jet of oxygen • • • acts only on the surface. • • • .' " (400 F.2d at page 48).

In their Australian application, the patentees stated that,

> " '• • • the gas jet does not penetrate into the bath of molten metal • • • and further an essential characteristic of the invention is that the gas jet does not penetrate into the bath • • •.' ". (400 F.2d at page 48).

In other applications the Appeals Court said,

> ". . . the amount of penetration was not even urged as the gist of the invention; rather the patentees contended that the good results of the L-D process were due to the maintenance of a proper ratio between the bath surface and bath depth.' " (400 F.2d at page 48).

Actually, the Suess et al. patent never in any of its prior applications, and in the continuation-in-part application, prescribed anything more than "impingement" of the **[427]** oxygen jet upon the center surface of the bath, the placement at the center surface of the bath of the "localized reaction zone," and as these were reflected in the claims of the oxygen being discharged "through the slag layer onto and below the surface of the bath at the central portion thereof . . . the contact of the oxygen with the bath resulting in reaction . . ."

Thus, in seeking a gauge by which the "deep penetration" as taught by Schwarz and Miles (400 F.2d at page 48) the Appeals Court not only discarded words but dwelt upon the term " 'practically negligible' penetration." In effect

it went outside anything advocated in the specification as summarized in the claims, and amplified phraseology used in the affidavits accompanying the continuation-in-part application.

As for the suggestions by the Appeals Court that "Even if 'avoidance of deep penetration' could be given a broader meaning than 'a practically negligible penetration' . . ." (400 F.2d at page 51), the file wrapper estoppel as found by the District Court "prevents the claims from being read so as to contain that limitation," and "the patent must be held invalid." (400 F.2d at page 51).

Since I have detailedly discussed the file wrapper estoppel question elsewhere (Compendium II), I need only note that the Appeals Court could only be guided **[428]** by the *sua sponte* thinking of the District Court and of the record which it had in that connection.

In reviewing the District Court's decision in that regard and the record, the Appeals Court said that,

> ". . . the determinative question on this issue is whether the Appellants did in fact cancel, surrender, or abandon the claim of 'avoidance of deep penetration by the oxygen stream' during the prosecution of Patent Application No. 547,233." (400 F.2d at page 52).

Yet, in reviewing the various applications and claims prior to the issuance of the patent, the Appeals Court stated that in the 1951 application,

> "No claim referred to avoidance of deep penetration as an element of the process." (400 F.2d at page 53).

And in Claims 1 through 15 that

> ". . . the Examiner did not mention avoidance of deep penetration directly as a conflicting element." (400 F.2d at page 54).

In this regard, as I stated elsewhere, prior to the issuance of the final patent, in the negotiations with the Primary Examiner (First post-trial hearing Compendium II), it was noticeable that at no time was the term "avoidance of deep penetration" discussed as a "conflicting element." Rather on the testimony particularly of the Primary Examiner, it was obvious that everyone knew that prior art practiced deep penetration, but that this Suess patent was attempting to word the "differentiation" from the prior art, particularly Miles, by emphasizing the surface activity of the oxygen and **[429]** metal in a "localized reaction zone." If this evidence had been before the District Court and there had been no need to provide a *sua sponte* decision in that regard, it is quite likely that the Appeals Court would not have said,

> "Although the record is void as to the content of the discussion with the Examiner on May 1, 1957, we believe that an inference of abandonment can be drawn from the omission of 'avoidance of deep penetration' from the final claims. In our opinion, if the element was as important as the affidavits imply, it would have been explicitly included in the claims; . . ." (400 F.2d at page 54).

It is obvious, then, that the real importance of the wording was not one of similarity to prior art but of the differentiation between the Suess et al. patent and the prior art. As well, the significance of placing the oxygen jet at the surface center of the bath, was not a matter of limitation of patent claims, but rather a clarification wording by the use of appropriate words as adopted in the words "blowing with oxygen, which comprises discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, to an extent to avoid material agitation of the bath by the oxygen stream, the contact of the oxygen with the bath resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities of the bath in a localized reaction zone . . ." (Ex.PX1, col. 12, lines 12-19).

[430] Again it would have facilitated the review by the Court of Appeals if the evidence, particularly of Primary Examiner LeRoy had been before the District Court, and it would then not have been required to make this statement,

> "In this case the issue of file wrapper estoppel hinges entirely upon the factual determination of abandonment or non-abandonment." (400 F.2d at page 54).

Except for the fact that the claims throughout this patent proceeding in the United States Patent Office, made the distinction in the deep penetration of the prior art and the avoidance of that deep penetration in the Suess et al. application as they were required to set forth the differentiation by law, none of the claims "particularly pointed out and distinctly claimed 'avoidance of deep penetration' as the subject matter which the applicants regard as their invention"; and that, further, as such the applicants never claimed " the gist of the invention" to be "avoidance of deep penetration" or "reduction of impact pressure".

The Appeals Court said,

> "Appellants have *insisted* throughout this case that they regard the *subject matter* of the patentees' invention to be 'avoidance of deep penertation'." (Emphasis Added) (400 F.2d at page 49).

Thereafter it referred to the requirements of Section 112 relating to claims, and then recited the two claims contained in the patent. Thereafter, it said,

[431] "No express reference to 'avoidance of deep penetration' is made in the claim." (400 F.2d at page 50).

I raise the question here then, if and since Section 112 commands that the claims must contain the subject matter particularly pointed out and distinctly claimed, which the applicant regards as his invention, why would the applicants "have insisted throughout this case that they regard the subject matter of the patentees' invention to be 'avoidance

of deep penetration'.''? This question is all the more emphasized when we know that it is the lawyers who conduct "the case" and that undoubtedly the lawyers in this case were experts in the handling of patent cases.

In my in-depth examination of this case, I have endeavored to find where the Suess patentees have claimed that "avoidance of deep penetration" is the *subject matter of the patentees invention.* In my close and repeated scrutiny of the record I have found many places where the plaintiffs have insisted at McLouth that the big *difference* between the Suess et al. patent and the prior art was that the Suess et al. patent avoided "deep penetration"; but nowhere was I able to find that it was its subject matter.

In this same connection the Appeals Court charged the McLouth plaintiffs with attempting "to incorporate the term in the claim by relating it to the phrase '••• to an extent to avoid material agitation of the bath by the **[432]** oxygen stream •••' and to the phrase '••• contact of the oxygen with the bath resulting in ••• a localized reaction zone spaced a substantial distance from the refractory lining •••'." (400 F.2d at page 50). It then found "yet neither of those phrases can be interpreted as limiting the penetration of the oxygen stream to a 'practically negligible' penetration." (400 F.2d at page 50).

I have discussed elsewhere, and on several occasions, that if the patentees had intended that "avoidance of deep penetration" was the "reduction of impact pressure" from the prior art of Schwarz and Miles, and that if this was the factor which was "the gist of the invention", it would have been required to have been stated in the specification and claims. Yet nowhere in the specification are these stated, nor were they ever stated as factors in any prior application filed in the United States Patent Office. What the specification does state, as reflected in the claims, as I have so often repeated, a series of instructions, which if followed as asserted in the specification, will result in "avoidance

of deep penetration", or certain effects result, although the oxygen jet does not penetrate . . ."

As for the matter of the phrase "to an extent to avoid material agitation of the bath by the oxygen stream", as it was discussed by the Appeals Court, it is apparent that the **[433]** *sua sponte* decision by the District Court carried through to the Appeals Court, and it was unaware, as was the District Court, of what had occurred in the Patent Office in the several weeks before the patent was actually issued, as this was related by the Primary Examiner (Ref. here to first post trial hearing Compendium II).

As for the Appeals Court consideration and discussion and interlinking of the term "practically negligible penetration", I believe from my study of the specification itself that the Court of Appeals, like the District Court, was unaware of the significance in the technically chemical functioning of the impingement of the oxygen jet upon the metal bath surface with its further technical chemical consequences. Neither was it aware of the chemistry significance of the terminology in the claim of the discharge of the oxygen "vertically downwardly through the slag layer *onto and below the surface of the bath* at the central portion thereof, to an extent to avoid material agitation of the bath by the oxygen stream, the contact of oxygen with the bath resulting in reaction . . ."

Since I have already elaborated on this phase of the impingement of the oxygen jet and its chemical generation of reactions, I need repeat here only that it would seem that by the instructions contained in the specification within its limitations as prescribed, the impingement of the jet **[434]** onto the surface of the liquid bath causes an indent which lies linearily below the surface of the bath (which witnesses testified contained the localized reaction zone), and certainly would satisfy the description by one of the applicants of the wording that their patent was limited to a " 'practically negligible' penetration or to a 'surface layer' pene-

tration" (400 F.2d at page 49); that the chemical interpretation between the oxygen atoms and the iron atoms violated the surface linearity of the molten metal, and that the words in the claim "onto and below" taking color from each other, placed the position of the jet in relationship to the surface and thus would also satisfy the words of limiting the jet penetration "to a 'practically negligible' penetration or to a 'surface layer' penetration."

Convinced of the idea that the patentees did make "avoidance of deep penetration" the "subject matter" of their invention the Court of Appeals concluded that even when read in the light of the specificaion, "these claims would not describe 'practically negligible' penetration to one skilled in the art. Hence, the patentees failed to describe their invention." (400 F.2d at page 50).

In relating its thinking about avoidance of deep penetration, the Court of Appeals restated what the District Court said that both Schwarz and Miles placed the same limitation on depth of penetration as it related these prior **[435]** arts to "*** a localized reaction zone spaced a substantial distance from the refractory lining." The difficulty of this thinking, as was pointed out under Compendium VII, was that the prior arts both placed the localized reaction zone on the *inside* of the bath; whereas Suess placed it on the *surface center* of the bath, and *depth* of penetration had no place in the instructions for the placement of the top center of the localized reaction zone in the scheme of the Suess process. Rather, the instructions on vertical, central placement of the nozzle, diameter opening of the nozzle, atmospheric pressure of the oxygen jet, distance from the bath and ratio of bath depth to area surface, were the instructions when followed which controlled impingement or control with the metal surface of the bath, without anything more. This the specification related variously throughout its instructions and explanations.

This, then, does not support the statement of the Court of Appeals that,

> ". . . in the instant case we are concerned with the patent *that varies from the prior art only in the alleged degree of penetration of the oxygen stream.*" (Emphasis added) (400 F.2d at page 51).

As stated elsewhere on many occasions, if avoidance of deep penetration was the only element involved in the Suess patent, then why would there have been any need for any other instructions including those past repeated here? **[436]** The Court of Appeals also stated,

> "As indicated earlier the specifications nowhere establish a standard for determining when agitation becomes material and nowhere relates the amount of agitation to the depth of penetration. . . . Whatever interpretation one skilled in the art might have placed on 'avoidance of material agitation', it would not have been the 'practically negligible' penetration that the patentees represented to the Patent Office as 'avoidance of deep penetration.'" (400 F.2d at page 51).

In coinciding these two ideas, it is apparent that the Court of Appeals did not have the thinking of the patentees that "material agitation" represented in part only the deep penetration as it provided the stirring, circulating or agitating action by the jet in the inside of the bath in the prior art of Schwarz and Miles. Thus, even if the specification of Suess or its claims contained the words "avoidance of deep penetration", its obvious significance would be, as it was found by the Primary Examiner, not one of degree of avoidance of penetration but of not injecting the oxygen jet so as to make it function on the inside of the bath.

We know, too, that neither Schwarz nor Miles provided for measurements of the recommended penetrations, rather both indicated simply that the oxidizing agent was to be injected into the bath, or into the interior of the bath and that was all. In any event, both Schwarz and Miles made us

aware of the fact that it could not be an impingement contact of the [437] oxidizing agent with the surface of the bath, but rather that the oxidizing agent had to be injected into the bath.

This then brings us to the *twelfth, thirteenth, fourteenth, fifteenth, sixteenth, seventeenth,* and *nineteenth* findings of the Court of Appeals which generally dealt with the matter of "avoidance of deep penetration" in its various phases of lack of explanatory differentiation from the prior art, lack of definition and limitation, lack of description of this phase as the subject matter of the invention, expanding this phase from the position of the applicants of a "practically negligible" penetration, and of the eventual abandonment of that phase of the claimed invention.

Deep Penetration Rulings

The Court of Appeals stated that the concept of avoidance of deep penetration

> "as an abstract phrase means no more to one skilled in the art than does 'deep penetration'. Depth of penetration can gain meaning only from the limitations placed upon it by the patents and from the knowledge that may be attributed to an ordinary worker skilled in the art." (400 F.2d at p. 41)

While the "Depth of penetration can gain meaning only from the limitations placed upon it . . .", when the frame of reference is changed from an abstract concept of "depth" qua [438] "depth" to depth in relationship to a converter vessel, the concept takes on a relative meaning. It is true that the patentees did not specify (as did not the prior art patentees) that one should penetrate one inch, five inches or twenty inches; however, it must be realized that they could not so specify because of the variation in size of steelmaking vessels—and that such knowledge would become encompassed in the expertise of the steelmaker. In fact the evidence of the defendant's steelmakers as reported

by the District Court admitted that a person skilled in the art could follow the teachings of the examples set forth in the specification and manufacture satisfactory steel; that the specification's teachings cover larger or smaller heats; that the teachings of the specification provide sufficient guidelines to persons skilled in the art desiring to manufacture steel in heats sizes of other than 36 tons; that ". . . according to the defendant's own testimony, persons skilled in the art can make satisfactory steel following the teachings of the 36-ton heat example given in the specification, and a person skilled in the art can apparently extrapolate from such conditions to determine the operating conditions for larger heat sizes." (257 F.Supp. at page 420-422). This satisfies the law, because the specification is to be addressed to those skilled in the art and is to be comprehensible by them. It may be, sufficient, though the unskillful may not be able to gather from it how to use the invention and it is evident [439] that the definiteness of the specification must vary with the nature of its subject. *Mowry* v. *Whitney,* 14 Wall. 620, 644 (1872); 81 U.S. 620, 644.

Thus while the specification does not contain inch or meter direction, the depth of penetration is controlled by the instructions in the specification of working within limits of height of nozzle from the bath surface, limits of nozzle opening diameters, limits of ratio of bath depth to bath diameter, and vertically, central placement of nozzles. Thus the specification tells us that the process controls the depth of penetration so as to create a "localized reaction zone" where the high temperatures are created and whence they are chemically diffused or impelled. These fully detailed by clear instructions and examples contained in the specification point out the limitation of the invention of blowing an oxygen stream at a pressure between 5 to 25 atmospheres vertically downwardly, through the slag, onto and below the surface of the bath at the central portion thereof, but only to such an extent as to avoid material agi-

tation of the bath by the oxygen stream so that when the contact of oxygen is made with the bath a chemical reaction results, *at the place of impingement,* whereupon the oxygen combines with the iron and oxidizable impurities of the bath, in what the specification calls the localized reaction zone spaced substantially away from the **[440]** refractory bottom and walls.

The specification is specific in describing the reactions which result in the exothermic iron gas evolution which produces a high temperature away from the refractory lining. It also causes the first activity which eventually produces a circulatory movement in the molten bath with endothermic chemical reactions, which also bring the other portions of the metal bath remote from the reaction zone into the reaction zone where they are subjected to the reaction in the localized impingement area for continuing chemical reaction as long as oxygen and oxidizable elements exist for chemical combination and all of this with minimum harm to the refractory lining.

Dr. Hauttmann one of the patentees and Dr. Elliott one of the plaintiffs' experts asserted that a steelmaker under the teachings of the specification knows when he is avoiding deep penetration within the meaning of the patent, when he does not blow deeply enough to cause refractory damage or to prevent the formation of a fluid slag (R. 6168-6170; R. 2764). The District Court gave its approval and stated that "... such process conditions as a fluid slag, the avoidance of slopping and the avoidance of refractory damage are admittedly part of the practice of steelmaking at McLouth." (257 F.Supp. at page 422).

Thus, a steelmaker skilled in the art he is practicing is made aware of what the character of penetration means in **[441]** regard to the particular vessel with which he is working and the potential pitfalls of the different prior art.

While this limiting parameter, which in part differentiates the Suess patent from the patents and teachings of

the prior art, is "avoidance of deep penetration", it is one which does not require definition by a ruler, but rather by all the instructions of the patent; since it is the entire teachings of this patent which reflect the difference between it and prior art practices and an admonition to avoid the prior art practices, not necessarily inclusive of only one prior art misuse of character of penetration into the bath for the purpose of stirring, circulating or agitating its contents.

The testimony of Dr. Hauttmann at the *McLouth* trial illustrates the difference between the present patent and the prior art. Dr. Hauttmann testified that, "The information received by Dr. Suess from Dr. Durrer and the information received by Dr. Trenkler from Mr. Hellbrugge was to the effect that the oxygen was to be blown through a nozzle deeply into the bath, in which case, as far as I remember, the nozzle was to be positioned at an angle; and on the basis of these suggestions, it was intended to accomplish what Lellep wanted to accomplish in his process and what Schwarz wanted to accomplish by blowing from above into the bath." (PX424, at page 2224).

[442] In summarizing the result of the test conducted at Linz in June of 1949 Dr. Hauttmann stated: "the test series which had been started on the 25th of June had shown us in its results that it was not correct to blow the oxygen, in accordance with the then teachings, deeply into the melt, and that a success can only be expected—by 'success' I mean application of this process in practice—if the process is carried out in such a way that the oxygen is blown from the nozzle vertically downwardly on the center of the bath's surface in order to create a hot reaction field in the upper region of the bath and by maintaining that hot spot at a corresponding distance from the lining." (PX 424 page 2250).

In summarizing the prior art and specifically the teachings of Durrer and Hellbrugge, Trenkler testified that if

one were to practice the teachings of Durrer-Hellbrugge he would "Go with the nozzle as close as possible to the surface of the bath and blow so strongly that you get with your jet into the lower regions of the bath and so guarantee the stirring of the bath with the oxygen jet." (PX 508 page 11910). (See also DX 5, DX 8, DX 251E).

Dr. Trenkler further dramatized the fact that prior to the work at Linz, the thinking of those skilled in the art of steelmaking revolved around the concept of deep penetration. In speaking of his conversations with Drs. Durrer and Hellbrugge at Gerlafingen, Dr. Trenkler testified "They told **[443]** me that the tests had been carried out as small as possible a distance of the nozzle from the bath and that that was the thing to do in order to blow the oxygen jet into the lower regions of the bath, *in order thus to insure a mechanical movement of the bath* and in order *to obtain a low iron content in he slag.*" (Emphasis added) (PX 508 page 11805). Dr. Trenkler further testified on cross-examination concerning the teachings of Doctors Durrer and Hellbrugge that "Their opinion and their teaching is that the oxygen jet has to penetrate into the lower regions of the bath so that a corresponding bath movement by the oxygen stream will be insured and a low iron content of the slag can be obtained." (PX 508 page 11894).

Dr. Trenkler also discussed an article written by Dr. Hellbrugge (M DX 61). On page 5 of the English version of that article it is stated "Therefore, in order to be able to operate with pure oxygen it becomes necessary to abandon the heretofore used method of blowing through the bath and to blow the oxygen onto the bath. The blowing onto the bath must not be done with too little pressure as otherwise there will only be a surface reaction. This means that too much oxygen is lost, the refining takes too long a time, and the iron content of the slag will be too high." (PX 508, page 11947).

Thus, while the Court of Appeals found the only difference **[444]** between Suess and the prior art to be the concept of avoidance of deep penetration and that its obviousness rested on that of fluid slag maintenance, the significance of this admonitory concept must be understood in the context of the teaching as a whole. By practicing the teachings of blowing vertically onto and below the central surface, and being careful to avoid deep penetration, one practices Suess rather than the prior art.

The Court of Appeals found that "The characteristics of the process that would place limitations on the depth of the penetration and that would meaningfully define the depth to one skilled in the art were found to be slopping, refractory damage, and fluidity of the slag." (400 F.2d at page 47). There is no doubt that these elements are important variables with which the patentees concerned themselves. The Appeals Court then continued that since the District Court found that the teachings of both Schwarz and Miles likewise involved avoidance of slopping and preservation of the refractory life, that the only differentiation between Suess and the prior art is the necessity of forming and maintaining an early fluid slag.

By this excerpt of the Court of Appeals, we are confronted with a one-sided view of what may happen when an insufficient impingement or contact is made by the oxygen stream or jet **[445]** with the molten metal bath that has been referred to in many places throughout this Opinion Compendium and in the opinions of both the McLouth District Court and Court of Appeals as slopping occasioned by an insufficient contact of the oxygen with the metal. Here the contact of the oxygen is made less with the metal and more with the slag, while in the prescription of the Suess patent the operator is instructed to direct vertical pressure through the slag and make impingement contact with the metal and so produce its results.

This last excerpt seems to have overlooked another fact that in the prior art of both Schwarz and Miles as well as that at Gerlafingen, the intention was to retain the iron

in the bath and not lose it to the slag. As Dr. Trenkler quoted Dr. Hellbugge, if the lighter application of oxygen is made in accordance with the instructions contained in the Suess specification an early fluid slag is created by reason of the entry into the slag of iron oxides, which in turn react upon sulfur and phosphorus. But evidently from what the steelmakers say, the unobvious expertise manifested by the Suess patent was conceiving how to create and maintain a fluid slag retaining a high content of iron in the bath. This the prior art never taught and was never able to do.

[446] One additional matter to which the Court of Appeals referred to in Footnote 11 (400 F.2d at page 48) inferred that the Gerlafingen blowing experiments were hampered because it did not have an oxygen plant, and because other factors made experimentation "cumbersome". The statement was made that Linz had "better conditions". There is no evidence in the record that the Linz experimenters possessed an oxygen plant during their experimentation period from early June, 1949 to the end of November, 1950. Their equipment was also home-made as is evidenced by the fact that in the first test the nozzle melted, and in the second test that the water surround broke and sprayed the metal. There were also indications that the experimenters were making make-shift appliances and improvement during the course of their experimentation. Thus, this character of evidence neither adds nor detracts from inventive discoveries which the Linz experimenters made as against the failure of the Gerlafingen experimenters to make inventive discoveries.

OPINION—THE JONES AND LAUGHLIN CASES

INDEX

	Page
PATENT VALIDITY	1
PRESUMPTION OF VALIDITY	2
A. Anticipation	3
1. The Schwarz Patent (DX5A)	4
2. The Miles Patent (DX10A)	6
3. Von Roll Plant News (DX163, Exhibit B)	7
4. Strassburger-McGarrity "Report on Investigation of European Steel Plants (October-November, 1949)". Copyright 1950, National Steel Corporation, Pittsburgh, Pennsylvania (DX-168, Ex.B)	10
B. Lack of Inventorship	14
C. Obviousness	17
1. Scope and content of prior art	19
2. Difference between prior art and the claims must be ascertained	21
3. Level of ordinary skill in the art	23
4. Secondary considerations	25
D. Double Patenting	30
E. The Specification comports with Section 112	39
F. The claims	52
FILE WRAPPER HISTORY	64
G. Lack of necessary statutory oath	80
H. Enforceability of the Patent	82
1. Fraud perpetrated on the Patent Office	83
2. Alleged misuse of the patent after its issuance	86

Page

3. Attempts to prevent relevant evidence from coming before the Court 86

I. Antitrust Defenses 87

BREACH OF CONTRACT AND PATENT INFRINGEMENT 95

Tests and Demonstrations—Localized Reaction Zone 114

Test and Demonstrations—Circulation 117

CONCLUSION AND DETERMINATION 127

Patent Validity, Breach of Contract and Infringement[1]

[1] The J & L defenses in these actions to a large extent parallel the *McLouth* defenses. Primarily, it is alleged that the Suess et al. process is an imitation of the prior art of Schwarz and Miles. In addition the defendants have raised additional defenses such as anti-trust violations, the Cuscoleca patent, and prior publications which allegedly reveal that the patent in suit was not an invention.

Patent Validity

It is now incumbent upon me to explain the voluminous record in this Court and to make a determination on the validity of the patent in suit.

In its broadly detailed opinion, the *McLouth* District Court scrutinized the many intricate facets of the Suess et al. patent and reluctantly reached the conclusion "... that the patent in suit is invalid, not only because of the statutory presumption of validity but also because of the revolutionary nature of the invention disclosed in the specification." (257 F.Supp. at page 441.) Judge Freeman's analysis and reporting represent an enormous undertaking and accomplishment as has been thoroughly discussed under Collateral Estoppel, *supra*. However, what compelled the *McLouth* District Court's "reluctant" conclusion was that despite the presumption of validity and the phenomenal nature of the discovery made at Linz, "... the failure of the claims to focus on or limit **[2]** themselves to the precise

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[1]Since extensive relevative details have been fully set forth in the Opinion Compendium filed in this case relating to the question of collateral estoppel in accordance with the guidelines of *Blonder-Tongue Laboratories, Inc.* v. *University of Illinois Foundation et al.*, 402 U.S. 313 (1971), for brevity, I incorporate those relevant and material findings in this Opinion. All record references in this *J & L* opinion are to the *J & L* record. Certain witnesses who appeared before the *McLouth* District Court were not heard here, but their transcribed testimony was presented in evidence either by stipulation of counsel, or by offers of either side.

advance in the art by the patentees renders the patent invalid. Certain elements of the claims are simply not adequately supported by the specification to justify the granting of a patent monopoly in the broad language used. (257 F.Supp. at page 442).

While I concur in many of the findings and conclusions reached by the *McLouth* District Court, there are several areas in which considerable critical disparity exists. To a large extent, these differences arise as a result of the additional evidence which was presented before me, and which was not before the *McLouth* Courts. Additionally, I had the advantage of the scholarly analyses and guidance of both *McLouth* Courts.

It should be observed preliminarily that because so much of this material has been discussed under Collateral Estoppel, the presentation in this section shall be in abbreviated form.

Presumption of Validity

A primary dictate of patent law is that "A patent shall be presumed valid . . . The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting it." 35 U.S.C. § 282. A heavy burden rests upon a defendant in a patent infringement suit to convincingly demonstrate that a patent or any of its claims are invalid. *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc.*, 461 F.2d 66, 75 (3d Cir. 1972), *cert. denied* 49 U.S. 997 (1972); *Eagle Iron Works* v. *McLanahan Corporation*, 429 F.2d 1375 (C.A. 3 1970); *Phillips Electronic and Pharmaceutical Industries Corp.* v. *Termal & Elec. Ind., Inc.*, 311 F.Supp. 17 (D.N.J. 1970), *affirmed* 450 F.2d **[3]** 1164 (C.A. 3, 1971). And, the presumption of validity only will be overcome by clear and convincing evidence of invalidity. *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc.*, *supra; Monsanto Company* v. *Rohm and Haas Company*, 312 F.Supp. 778 (E.D. Pa. 1970) *affirmed* 456 F.2d 592 (C.A. 3, 1972), *cert. den.* 407 U.S. 934 (1972), *rehearing den.* 409 U.S. 899 (1972). See also: *Stamicarbon, N.V.* vs. *Escambia Chemical Corporation*, 430 F.2d 920 (C.A. 5, 1970); *Boas Box Company* v. *Proper Folding Box Corporation*, 330 F.Supp. 401 (E.D.N.Y., 1971).

A. Anticipation

It is provided in 35 U.S.C. § 102, inter alia:

"A person shall be entitled to a patent unless—

"(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

"(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States . . ."

The defendant alleges that the Suess patent is invalid under Sec. 102(a) and 102(b) because the alleged invention was patented or described in prior printed publications, namely: (1) the Schwarz German Patent No. 735,196 (DX-5 and 5-A); (2) the Miles patents;[2] (3) the Von Roll Plant News (DX-163), and (4) the Strassburger & McGarrity "Report on Investigation of European Steel Plants" (DX-168).

[4] 1. The Schwarz Patent (DX-5A)

The Schwarz German patent, No. 735,196 published July 3, 1943 (DX-5A) discloses a concept of jetting oxygen

[2] Three Miles patents which are substantially identical in nature have been presented here for consideration. They are (1) the Miles British Patent No. 642,084 (DX-8); (2) the Miles French Patent No. 933,098 (DX-9 and 9A), and (3) the Miles Belgian Patent No. 468,316 (DX-10 and 10A). Reliance here, is placed on the Belgian patent because of its earliest filing date.

enriched air or pure oxygen onto the surface of the bath with such high kinetic energy that it is capable of penetrating in the manner of a solid body deep into the bath by the use of extremely high velocities lying preferably above the speed of sound, and thereby providing a means for refining pig iron into steel (DX-5A, p. 2 lines 7-8).

The defendant alleges that it was practicing the prior art of Schwarz,[3] and alleges that as a practical matter, there exists an identity between Suess and Schwarz (R. 4719-20). However, the defendant's witness, Dr. Durrer, testified that the Schwarz method does not produce practical results (PX-510, pp. 5084-85). Dr. Chipman's testimony corroborated this conclusion (R. 528), and further related that to his knowledge, the Schwarz process was never commercially adopted (R. 840).

The Suess patent teaches blowing onto and below the surface of the bath to an extent to avoid material agitation of the bath by the oxygen stream. Dr. Chipman testified that Schwarz on the other hand taught deep blowing (R. 836); did not provide for adequate phosphorus removal (R. 839-840), and produced undesirable wear of the refractory (R. 529). Dr. Chipman further testified that if one blows according to Schwarz, he **[5]** cannot produce a localized reaction zone (R. 725-731).

The Rinesch affidavit (PX-2A, pp. 78-87) discloses that the patentees were aware of the work of Schwarz and Miles which ". . . made us realize that deep penetration of the bath by the oxygen jet must be avoided, if we were to obtain a high quality iron ,or steel and at the same time, have a satisfactory operating life for the lining of the converter." (PX-2A, pp. 70-80). The Hauttmann affidavit contains similar disclosures (PX-2A, pp. 88-92).

[3] It will be remembered that McLouth unsuccessfully raised this defense in Detroit.

Dr. Elliott testified that with deep penetration inadequate amounts of FeO are formed thereby preventing the slag from removing phosphorus (PX-504, pp. 6069-74). That is, if the oxygen penetrates deeply, too little of it is available in the slag layer, thereby producing a "dry" or non-fluid slag (PX-504, pp. 6169-70). This dry slag prevents adequate phosphorus removal. This conclusion was verified by Dr. Hauttmann (PX-424B, pp. 2760, 2762-63; PX-424, pp. 2772-73) and Dr. Trenkler (PX-508, pp. 11940-42). Judge Freeman accepted this conclusion[4] based on the testimony of McLouth's Vice-President (PX-473, pp. 3483-86) and its superintendent (PX-471, pp. 6692-93). Dr. Chipman also verified this conclusion from the Linz repetition tests (R. 486-94).

The purpose of the Linz repetition tests, which were conducted at Linz, Austria in 1966, was to repeat the 1949 Linz experiments, and to verify the statements contained in the **[6]** Rinesch and Hauttmann affidavits. Mr. Trupp testified concerning the circumstances surrounding the tests (R. 1667-1738), and the relevant exhibits are PX-42A through PX-42M and PX 50.

The inoperable prior art references to Schwarz does not negate novelty. *United States* v. *Adams*, 383 U.S. 39, 50 (1966); *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc., supra; Consolidated Window Glass Co.* v. *Window Glass Mach. Co. et al.*, 261 Fed. 362 (3d Cir. 1919). And I conclude, as did the *McLouth* District Court that, "the conclusion is, therefore, inescapable that the patent in suit is not anticipated by the Schwarz patent under 35 U.S.C. § 102". (257 F.Supp. at 391).

2. The Miles Patent (DX-10A)

Because there do not exist any material distinctions between the Miles Belgian, French and British patents, for

[4] See 257 F. Supp. at 389-90.

purposes of discussion reference will be made to the Belgian patent.[5]

While the defendant argues the Miles patent as a separate and distinct defense, the record reveals that the defendant considered Schwarz, Miles and Durrer-Hellbruegge to be essentially equivalent. (R. 4721, 4725-26).

Miles discloses a process of blowing a liquid (DX-10A, p. 2 line 12) composed of from 70% to 98% oxygen (DX-10A, p. 2, line 10, p. 5, line 1) downwardly onto the molten iron bath angularly (DX-10A, pp. 4-7, 9, 13, 14, 17) and preferably at an [7] angle between 30 to 75 degrees (DX-10A, p. 17, line 12) deeply penetrating so as to circulate the molten metal and assure reaction with the oxidizable impurities in the metal. The jet itself performs the function of maintaining vigorous agitation of the bath (DX-10A, pp. 4, 10, 13, 18). Dr. Durrer testified (PX-510, p. 5085) the work of Miles, like that of Schwarz yielded no practical results. As the *McLouth* District Court concluded, "... the Miles patent cannot be said to anticipate the patent in suit for a number of reasons: the patent in suit contains specific and detailed operating conditions and teachings either not found in Miles or not recommended by Miles, or contradicting the teachings of Miles; and, further, the evidence in the record indicates that Miles' teachings did not and indeed could not lead to good results in steelmaking comparable to those achieved by the patentees." (257 F.Supp. at page 393). With this conclusion I am in accord.

Thus because both the Schwarz and Miles patents failed to anticipate the patent in question under Sec. 102, if any defense of anticipation is to have merit, it must rest on either the Von Roll Plant News or the Strassburger & McGarrity "Report on Investigation of European Steel Plants."

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[5] The three Miles Patents are British Patent No. 642-084 (DX-8), French Patent No. 933,098 (DX-9A) and Belgian Patent No. 468,316 (DX-10A).

3. Von Roll Plant News (DX-163, Ex. B)

Professor Durrer was a distinguished Swiss metallurgist who had received world-wide recognition for his contributions to iron and steelmaking, particularly in the use of oxygen (DX-245, pp. 5006-5011; DX-248). During the early stages of World War II, [8] Durrer returned from Germany, where he had been a Professor of Metallurgy at the Institute of Technology in Berlin, to his native Switzerland, where he received an appointment at the University of Zurich. At the same time he became Technical Director of Von Roll Eisenwerke, a leading steel manufacturer in Switzerland, which had its headquarters and an operating plant at Gerlafingen, Switzerland (DX-245, pp. 5001-03, 5011).

Commencing in 1947, Durrer undertook experimental work in refining pig iron with oxygen at Gerlafingen (DX-246B, p. 4855; DX-258E, p. 5). To further his experimentation he secured permission for his former student, Dr. Heinrich Hellbruegge, to leave occupied Germany and assist him in his efforts (DX-245, pp. 5012-13; DX-246, pp. 4521-21A, 4524-25; DX-163, EX. B. p. 2.)

Evidence of the work performed at Gerlafingen was presented in the May 1948 issue of the Von Roll Plant News (DX-163 Ex. B) and the enlargements of the photographs therein (DX-50, 51, 52); a memorandum by Dr. Trenkler reporting his visit to Gerlafingen in May 1949 (DX-56E); the article written by Hellbruegge in the December 1950 issue of *Stahl* v. *Eisen* (DX-258E); and the report by Strassburger and McGarrity on Durrer's work at Gerlafingen (DX-168, Ex. B. pp. 103-06).

The May 1948 newspaper "Von Roll Plant News" (DX-163, Ex. B) contains an article by Durrer which the defendant urges in support of its contention that the patentees did not invent the subject matter of the patent in suit and that therefore the patent is invalid under Sec. 102. The de-

fendant does not urge, nor could it, that prior use abroad is, as prior *art*, a bar to [9] patentability under Sec. 102(b). Before a publication will be considered anticipatory under Section 102, it is necessary that:

> ". . . the description and drawings contain and exhibit a substantial representation of the patented improvement, in such full, clear, and exact terms as to enable any person skilled in the art or science to which it appertains, to make, construct, and practice the invention to the same practical extent as they would be enabled to do if the information was derived from a prior patent. *Mere vague and general representations will not support such a defense*, as the knowledge supposed to be derived from the publication must be sufficient to enable those skilled in the art or science to understand the nature and operation of the invention, and to carry it into practical use. Whatever may be the particular circumstances under which the publication takes place, the account published, to be of any effect to support such a defense, must be an account of a complete and operative invention capable of being put into practical operation." *Seymour* v. *Osborne*,, 78 U.S. 516,555 (1870). (Emphasis supplied).

See also: *McCullough Tool Company et al.* v. *Well Surveys, Inc.*, 343 F.2d 381 (10th Cir. 1965); *cert. denied* 383 U.S. 933 (1966); *rehearing denied* 385 U.S. 995 (1966); *Dewey & Almy Chemical Co., et al.* v. *Mimex Co., Inc.*, 124 F.2d 986 (2d Cir. 1942).

The Von Roll Plant News of May 1948 reveals little in the way of anticipation of the Suess work. It merely, in very general terms, reveals the use of oxygen in the refining of pig iron: "In order to refine pig iron into steel, it is necessary to reduce its carbon content . . . This reduction occurs by means of combustion with the aid of oxygen which oxidizes the carbon, a reaction occurring in every case where carbon is burned . . . Oxygen is brought in contact with the liquid pig iron either in a combined form . . . or in a free form [10] . . . Free oxygen in the form of

air is blown *through* the molten pig iron . . . Smelting and refining with pure oxygen or with oxygen-enriched air will modify iron recovery decisively, and leading iron producing countries have already begun to tackle this problem with great energy . . . necessary preparations are in course in our Gerlafingen plant, and on the first day of spring, Dr. Heinrich Hellbruegge, or 'oxygen man' has conducted the first test, and thus pig iron was refined to steel with undiluted oxygen (oxygen-refining) for the first time in Switzerland . . ." (Emphasis added). This vague description of the work at Gerlafingen does not in any way contribute to an understanding of the basic oxygen method of producing steel. It, in fact, does little more than indicate that at Gerlafingen an attempt was made to use "undiluted oxygen" in the refining process. No indication is made as to whether the blow was made from the top, side or bottom, or where the jet was directed; or how the jet was controlled, but only that it was through the molten pig iron. Because of its failure to disclose the patented process, the Von Roll News Letter is not an anticipatory publication. *Seymour* v. *Osborne, supra; McCullough Tool Company* v. *Well Surveys, Inc., supra; Dewey & Almy Chemical Co.* v. *Ninex Co., Inc., supra.*

4. Strassburger-McGarrity "Report on Investigation of European Steel Plants (October-November, 1949)." Copyright 1950, National Steel Corporation, Pittsburgh, Pennsylvania (DX-168, Ex. B).

The Strassburger-McGarrity report is a summation of the [11] author's discussions with Durrer who amongst other things related information concerning the work at Linz (DX-168, Ex. B, pp. 96-106). The portion of this article which is of interest, commences on p. 103 and is sub-headed "Oxygen on the Basic Converter." Prior to this discussion the report summarizes a visit to Linz on October 24 and 25, 1949, as follows:

"Our impressions of the steel plant of Voest at Linz, Austria, were very favorable, particularly after inspecting other plants in Europe. Voest had modern type blast furnaces using a high sinter burner with good blast furnace practice and a very low coke rate . . . The research program being carried on at the plant with the small converter all points to a large 40-60 ton basic converter installation with the use of oxygen either through the bottom mixed with the air or 98% oxygen jetted down on the bath. The plant management gave the impression of being agressive and on their toes on new developments." (DX-168, Ex. B. p. 15).

The report continues, pp. 103-104:

The plant at Gerlafingen, ". . . has a 2½ ton experimental converter for oxygen trials. The oxygen is introduced through a water-cooled jet from above, jetting down on top of the bath . . . The steel quality produced has been good and the entire blast supplied to the converter was through the oxygen jet above the metal. High purity oxygen close to 98% purity is a distinct advantage in this process . . . it has stated that it is cheaper to produce the oxygen required for this process at 150 pounds pressure than to blow the very much larger quantity of air through a bottom-blown vessel at 30 pounds pressure . . ."

The report continues to explain that Dr. Durrer is one of a group of individuals working on this project, and that amongst others who were considering its ramifications was Dr. Suess at VOEST (p. 104). The report adds, pp. 104-106:

"It was stated that Voest in collaboration with Dr. Durrer has made extensive experiments on a small converter using top blown oxygen and that Voest is now starting to build a new converter plant and oxygen plant for the operation of the converter with oxygen blown on top of the bath. This whole development of [12] oxygen on top of the converter bath has been brought about by the experience gained with the use of oxygen jets on an electric furnace without using the electrodes for melting the charge. In the oxygen top blown converter, the scrap will be added during the blow in increments by special charging equipment.

"We want to point out that the development of the oxygen top blown converter is one of the most important and interesting developments found on our trip to Europe. As you will note there have been three plants where experimental work has been carried on in small convert (sic) for developing this process, namely, at Linz, Huckingen and at Dr. Durrer's plant at Gerlafinge. The oxygen top blown converter is being developed to produce a high grade open hearth steel in a basic converter with low nitrogen and oxygen contents in the metal and suitable for deep-drawn sheets . . .

"Our conference with Dr. Durrer was most interesting. He was the most informed person with whom we had contact in Europe and undoubtedly a man of vision and had lived up to his reputation of being the foremost man in metallurgy in Europe. He is working under handicapped conditions in Switzerland with high priced coke and iron ore and by his ingenuity has developed the electric oxygen process as a means of making iron and steel in a small plant . . . He is very enthusiastic about the use of oxygen and this is no doubt due to the large savings in electric power that has been made possible in his plants by the use of oxygen instead of using electrical power by itself for the melting of scrap and iron, as well as the improvement in steel quality by the use of oxygen on the basic Thomas converter."

While these findings are without question a tribute to Durrer's pioneering efforts in this field, there does not appear to be any conclusive indication attributing the process of the patent in suit to Durrer. At best there is an indication that as of October 1949 Durrer, along with others, was searching for a practical means for utilizing the theory of applying oxygen from above. This evidence adds credence to the conclusion reached earlier that the work of Durrer was essentially experimentation, and development of the process devised by [13] Schwarz.

However, even if one assumes that the Strassburger-McGarrity Report describes the invention, it cannot be con-

sidered prior art because of its publication after January 16, 1951, the date on which the instant patent application was originally filed.[6] The record reveals that on January 17, 1950, patent counsel for National Steel Company received a letter from Strassburger dated January 16 informing him that 3 copies of the report would be forwarded under separate cover (DX-168A). By letter dated January 27 (DX-168C) counsel acknowledged receipt of the reports and indicated a future intent to register the report for copyright, but at that time related a decision to delay application for copyright. Again on October 3, 1950, a decision was made to delay application for copyright "until the book has been more widely distributed" (DX-168E). Finally, on March 6, 1951, an application for copyright was filed (DX-168F). In the Certificate of Registration (DX-168G) it is stated "The affidavit states that the book was published on January 27, 1950, in the United States."

It is settled law, that a document is not considered a prior publication under Section 102 unless it was accessible to the public. *Application of Tenney*, 254 F.2d 619 (C.C.P.A. 1958); *Dow Chemical Co.* v. *Williams Bros. Well Treating Corporation*, 81 F.2d 495 (C.A. 10, 1936), *cert. denied* 298 U.S. 690 (1936); *Reeves* v. *Keystone Bridge Co., et al.*, 20 Fed. Cas. 466 (Fed. **[14]** Case No. 11,660) (C.C.E.D. Pa., 1872); United Chromium, Inc., v. General Motors Corporation, 11 F.Supp. 694 (D.C.D. Conn. 1935), *reversed on other grounds*, 85 F.2d 577 (C.A. 2, 1936).

Thus, the patent in suit is not anticipated under § 102(a) or under § 102(b).

B. Lack of Inventorship

It is provided in 35 U.S.C. § 102(f) that

> "A person shall be entitled to a patent unless—(f) he did not himself invent the subject matter sought to be patented . . ."

[6] The certificate of registration in the Copyright Office states that the book was published on January 27, 1950.

The defendant contends that the patentees did not invent the process described in the specification of the patent in suit, but rather that it was invented by Drs. Durrer and Hellbruegge at the Von Roll Eisenwerke plant during the period from 1947 through 1949. Essentially the work of Drs. Durrer and Hellbruegge consisted of blowing oxygen from above onto the surface of a molten bath. However, in both the present *J & L* case[7] and the prior *McLouth* **[15]** case,[8] it was conceded that the work at Gerlagingen consisted essentially of following the teachings of Schwarz.

[7] During the course of the proceedings in this Court, the following exchange took place between the Court and Mr. Blenko, counsel for the defendant (R. 4725-26):

> "THE COURT: Then how do you contend that the Durrer-Hellbruegge process differed if at all from the Suess patent?
> MR. BLENKO: I contend that the Durrer-Hellbruegge work contains everything of substance in the Suess patent, but does not contain the frivolous and totally erroneous requirement that there be avoidance of material agitation.
> THE COURT: And, if the Suess patent is in effect a repeat of the Schwarz and Miles patents and is in effect a repetition of the Durrer-Hellbruegge process, then the Durrer-Hellbruegge process is by the same token a repeat of Schwarz-Miles?
> MR. BLENKO: Yes."

[8] During the *McLouth* proceedings, a similar exchange occurred between the Court and Mr. Groner, counsel for the defendant (See p. 13,503 of Plaintiffs' Estoppel Exhibit J-40, the McLouth transcript):

> "MR. GRONER: . . . The patent in suit is limited to vertical blowing. Durrer had vertical blowing, Schwarz taught what could only lead to vertical blowing, and Miles specifically included in his teaching vertical blowing.
> "THE COURT: Well, then, you admit that Schwarz and Miles and Durrer and Hellbruegge all teach the same method.
> "MR. GRONER: There are minor detail differences, but so far as the basic method is concerned, they are alike as peas in a pod."

Based on this statement and other matters in the record, Judge Freeman stated: "It is admitted by defendant that the practice of Dr. Durrer and Dr. Hellbruegge at Gerlafingen was essentially indistinguishable from the teachings of the Schwarz patent." (257 F.Supp at 407).

In an article "The conversion of pig iron into steel in the converter by using pure oxygen" by Hellbruegge,[9] it was stated that ". . . in order to be able *to operate with pure oxygen, it becomes necessary to abandon the heretofore used method of blowing through the bath* and to blow the oxygen onto the bath. The blowing onto the bath *must not be done with too little pressure as otherwise there will only be a surface reaction. This means that too much oxygen is lost, the refining takes too long a time, and the iron content of the slag will be too high.*" (p. 5). The article continues at page 7, "The oxygen was blown onto the bath with a pressure of 6 to 8 atu. The *pressure of the oxygen jet must be sufficiently strong to cause the jet to penetrate* into the bath, especially at the beginning and toward the end of the melt. There was hardly any throwout, even when increased pressure, for instance, 10 to 12 atu was used **[16]** for blowing." (Emphasis added) in concluding the Article, Dr. Hellbruegge stated that, ". . . it is possible to refine pig iron of varying composition with pure oxygen . . . Refining with pure oxygen eliminates the heretofore encountered narrow analytical limitations for Thomas or Bessemer pig iron." (p. 14). While Dr. Hellbruegge testified in *McLouth* (PX-J-15 pp. 4895-96) that this article was not a complete disclosure of the many details of their work, it would appear that at best it is a superficial discussion of possibilities, and not substantial practice and is indicative of the art at that time. Furthermore, the article was published in December, 1950 almost a year after the Austrian patent application was filed by Suess, and just prior to the American Application.

After a thorough and detailed analysis of the work at Gerlafinge, the McLouth District Court concluded:

> "The marked improvement in the quality of the steel produced in regard to phosphorus removal in the June 25th series of tests without even the use of an afterblow, and also the considerable inprovement in refractory life indicate strongly to this Court that the June 25th tests at Linz *represented a different and more successful process than had been practiced or disclosed by Dr. Durrer and Dr. Hellbruegee.* These tests, involving a relatively low impact pressure of the jet on the bath as opposed to the recommendation of Dr. Durrer and Dr. Hellbruegge, remedied what Dr. Trenkler had stated to be the two major defects of the Gerlafingen process, namely, excessive phosphorus content in the steel produced and insufficient refractory life." (257 F.Supp. at page 415). (Emphasis added).[10]

[17] This ultimate conclusion, once again illustrates that the work performed by Drs. Durrer and Hellbruegge did not contain any innovative processes but rather sought to find a means of employing the prior art successfully.

> "The defense of prior use is one that an alleged infringer, although free to raise, has the burden of persuasion. This burden is a heavy one, having been described by this Court as necessitating evidence that 'must be so strong as to remove all reasonable doubt

[9] *Stahl and Eisen* article December 21, 1950, Vol. 70, No. 26 pp. 1208-1211 (DX-258E)

[10] To a large extent, the evidence on this point which was before the *McLouth* District Court, was introduced in these J & L cases. Dr. Durrer had testified that the Schwarz patent contained his ideas (PX-510, p. 5101). Dr. Trenkler indicated that an operative process did not exist at Gerlafingen in May 1949 (PX-508, p. 11911).

As late as July 28, 1952, Hellbruegge was still advocating the use of a deeply penetrating jet. In a letter to Dr. Kafka, Hellbruegge stated that he believed the Linz work to involve deep blowing similar to Schwarz (DX-255E, p. 4). This belief was incorporated by Hellbruegge in his testimony (DX-246, p. 4667).

In regards to his visit to Gerlafingen in June, 1949, Dr. Trenkler testified ". . . while at Gerlafingen, I received from both gentlemen, but particularly from Dr. Hellbruegge, the communication that it was necessary in conducting oxygen top blowing to blow deeply." (PX-508, p. 11950).

Hellbruegge testified that in all his experimental work an afterblow was necessary in order to provide adequate phosphorus removal (PX-511, pp. 4915-16).

thereof.' . . ." *Jones Knitting Corporation et al.* v. *Morgan et al.*, 361 F.2d 451, 455 (3 Cir. 1966)

From the discussion above, I conclude that the defendant has failed to show that a valid defense can be raised under Section 102(f).

C. Obviousness

It is provided in 35 U.S.C. § 103 that:

> "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

[18] This provision was more thoroughly analyzed in *Graham* v. *John Deere Co.*, 383 U.S. 1, 17-18 (1966):

> "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented."

The prior art must be determined as of the time the earliest foreign patent application was filed. 35 U.S.C. § 104, 119. The patentees filed their Austrian application on January 31, 1950, however, the record discloses that a prior Swiss application was filed on January 27, 1950.[11]

[11] The defendant argues that the failure of the patentees to cite the prior Swiss application as the earliest foreign application date (pursuant to 35 U.S.C. § 119) perpetrated a fraud on the Patent Office. This issue is discussed further under the question of fraud, *infra*.

As Judge Freeman found, I too find that the essential issue to be considered under Sec. 103 is whether or not the subject matter of the patent in suit would be obvious to one skilled in the art at the time the invention was made. As the Court stated in *Graham, supra,* the question of obviousness is to be determined in view of the prior art, and the level of skill of those in the pertinent art. To these considerations one also includes an examination of the claims in the light of prior art, commercial success, unsolved needs, and failures of others. As the Court of Appeals for the Third Circuit states in *Philips Elect. & P. Indus. Corp.* v. *Thermal & Elec. Indus.*, [19] 450 F.2d 1165 (3d Cir. 1971), "It was, therefore, necessary for the trial court to ascertain the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art." 450 F.2d at page 1172,

That is,

> ". . . unless more ingenuity and skill . . . were required . . . than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention." *Hotchkiss* v. *Greenwood,* 52 U.S. 248, 267 (1850).

1. Scope and Content of Prior Art.[11.1]

Prior art is " 'The existing state of knowledge in a particular art at the time an invention is made. It includes the issued patents . . . , publications, and all other knowl-

[11.1] A more highly detailed explanation of the prior art and the instant patent has been presented in the Compendium. In the interest of brevity, those relevant references in the Compendium are adopted and incorporated here, by reference.

edge deemed to be common thereto such as trade skills, trade practices, and the like!'' *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc., supra* at p. 69 n. 3.

The prior art Schwarz and Miles patents have already been discussed. In summary form, it may be stated that they teach the necessity of blowing deeply, and non vertically into the bath so that the bath itself is agitated by the physical force of the oxygen stream. Furthermore, I am in substantial accord with Judge Freeman's conclusion that:

> ". . . the Schwarz German patent and the Miles Belgian patent taught and claimed processes of steelmaking involving blowing oxygen into a bath of molten pig iron from above. Schwarz taught blowing deeply into the bath in the manner of a solid body . . . and, although Miles did not expressly teach 'deep' penetration, it is conceded by the parties that Miles' teachings involved a deep penetration of the bath by the jet . . . With regard to the blowing, the angle of the jet in the Schwarz patent is unspecific and the Miles patent recommends blowing at an angle of between 30 and 75 degrees . . . The Miles patent teaches that the action of the jet itself agitates **[20]** and circulates the bath . . . but the Schwarz patent *contains no such teaching.* Both the Schwarz and Miles patents contain reference to a *limited center of chemical reactions in the bath* caused by contact of the jet with the bath surface . . . Additionally, both the Schwarz and Miles patents teach that the danger of excessive refractory wear is avoided in their methods of steelmaking because the *chemical reactions take place at the center of the bath,* away from the refractory lining . . . The parties agree that the gist of the teachings of both the Schwarz and Miles patents is the necessity of penetrating deep into the bath by the oxygen jet.'' (257 F.Supp. at pages 397-98). (Emphasis added).

Furthermore, we are reminded of the testimony of Dr. Durrer, that the prior patent failed to lead to practical commercial steelmaking processes (PX-510, p. 5085).

Both during the trial and at final argument, counsel for the defendant relying on DX-212 and DX-213 advanced the contention that indeed the depth of the Miles penetration is slight compared with that of the patent in suit. This position is without foundation. If one examines the absolute depths of penetration of Miles and Suess and the defendant's operations at Aliquippa and Cleveland as indicated on DX-212 and DX-213, one might initially assume that the Miles penetration is slight as compared with that in the Suess process. These exhibits, however, exclude a critical consideration. Depth of penetration is a relative measure and one can only say that penetration is slight or deep in relation to the depth of the bath being **[21]** penetrated.[12] Furthermore, in view of the fact that both the Schwarz and Miles patents were before the Patent Office for consideration, their weight as prior art is greatly diminished. *Hartford National Bank & Trust Co. et al.,* v. *E. F. Drew & Co., Inc.,* 237 F.2d 594 (3d Cir. 1956).

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[12] Table based on DX-212 (R. 4481-82) and page 37 of Plaintiffs' Reply Brief:

Operation	Bath Depth	Penetration	% Penetration
Miles	16 inches	6.9 inches	43%
Aliquippa Single Hole Nozzle	38 inches	5.0 inches	13%
Aliquippa Two Hole Nozzle 1	38 inches	4.0 inches	10.5%
Cleveland M16C		6.0 inches	9%
Nozzle	68 inches	8.0 inches	12%
Cleveland M18C	78 inches	6.5 inches	9.5%
Nozzle		9.0 inches	13%

Table based on DX-213 (R. 4483-87) and page 36 of Plaintiffs' Reply Brief

Operation	Bath Depth	Penetration	% Penetration
Miles	16 inches	6.9 inches	43%
The patentees following Miles	19.6 inches	8.2 inches 1	43%
Suess et al. Patent	39.4 inches	12.5-13.0 inches	33%

2. Difference Between the Prior Art and the Claims Must Be Ascertained.

To a large extent, these differences have been exhaustively reviewed under collateral estoppel. For this reason, they will be presented in summary form here.

The patent in suit teaches discharging a stream of pure or nearly pure oxygen substantially vertically, downwardly through the slag layer onto and below the surface of the bath at the central portion thereof. Schwarz on the other hand does not reveal a controlled, central, vertical blowing. The **[22]** same is true of the Miles process.

The patent in suit further teaches that the oxygen is blown to such an extent to avoid physical agitation of the bath by the oxygen stream.[13] In contradistinction, Schwarz taught that the oxygen stream must penetrate the bath like a solid body (DX-5A, p. 2). The results of Schwarz's practice led to inadequate phosphorus removal and rapid destruction of the refractories (R. 529, 839-840). Miles teaches that the jet itself serves to circulate and agitate the bath (DX-10A, p. 10).

The Suess process further teaches that the most significant oxidation reaction occurs in a localized reaction zone spaced a substantial distance from the refractories, thereby preserving the vessel. Schwarz on the other hand teaches deep penetration of the jet so that reaction occurs wherever oxygen and metal are in contact. Thus, one may assume that reaction occurs throughout the bath with resultant refractory damage (R. 725,731). No localized reaction zone is taught by Miles, and with its deep penetration, oxidation occurs throughout the bath.

The patent in suit also teaches that circulation in the bath is chemically induced and not disturbed by any physical result of the force of the impinging oxygen stream.

[13] See discussion on avoidance of material agitation, *supra*.

This is distinctly different from Schwarz who achieved a degree of physically induced circulation from the force of the oxygen stream itself. Miles likewise teaches that the jet itself, **[23]** physically causes circulation in the bath (DX-10A, p. 18).

In summary fashion it may be stated that Schwarz and Miles taught the necessity of blowing oxygen deeply into the bath so that the physical force of the jet itself agitates and circulates the bath. The opposite is true of the patent in suit in which the physical force was minimized as much as possible. That is, the Suess process reduces impact pressure to such an extent to avoid physical agitation of the bath by the oxygen stream. Furthermore, by so restricting the reaction zone to a localized area, damage to the refractories was substantially prevented.

3. Level of Ordinary Skill in the Art.

The level of skill in the art at the time the invention was made, may be gauged from the "amazement" of Dr. Chipman (R. 576); Mr. Prince' comment that he didn't think it was possible (R. 3208-11); Dr. Elliott's astonishment (PX-504, p. 6324); and Dr. Durrer's reaction (DX-251E).

Thus, it appears that the patent in suit far surpassed the level of skill in the art, and was thus non-obvious to those skilled in the art.

Further evidence of the lack of obviousness is shown by the fact that numerous persons skilled in the art had unsuccessfully attemped to produce satisfactory steel by blowing onto the bath from above. As was stated at the final argument by counsel for the plaintiffs (R. 225-26):

[24] "Next, we have the Durrer-Hellbruegge history which shows that the invention in issue is not obvious to those skilled in the art. This history of failure to solve the problem of using high purity oxygen in the blowing of steel, although preaching that it should be solved, extends over a period of two decades. Dr. Dur-

> rer recognized after the Linde-Fraenkl invention that if oxygen was available and he tried it out in small tests, he got nowhere. He tried again in the 30's. There were small experiments in the school. And then he tried it out in a two-ton vessel at Gerlafingen in 1948. And that wasn't successful. He tried again in 1949, and the evidence here shows that that was not successful.
>
> "So you have not only 10 to 14 highly-skilled men in the art trying to solve the problem as Durrer testified and who as Dr. Durrer testified failed, we have Dr. Durrer and Dr. Hellbruegge also failing." [14]

The very mundane, and yet very real question arises that if the process described in the patent in question was obvious to those skilled in the art of steelmaking, why wasn't satisfactory steel produced pursuant to the teachings of Schwarz, Miles and Durrer-Hellbruegge prior to the time of the patent in suit? Why were know-how agreements entered into between the defendant here and the plaintiffs, or between McLouth and the plaintiffs, if in fact the process was obvious to those skilled in the art?

The use of oxygen itself was not a novel concept. It had been suggested as early as 1856 by Bessemer (PX-510, p. 5107). The practical implementation of the concept, however, did not occur until almost a century later. The fact that there was a technological block in the practical implementation of a concept which those skilled in the art had failed to eliminate is strongly supportive of the concept of lack of obviousness, *United States* v. *Adams, supra; Trio Processing Corporation* v. *L. Goldstein's Sons, Inc., supra; National Latex Products* [25] *Company* v. *Sun Rubber Company,* 274 F.2d 224, 240 (C.A. 6, 1959), although commercial quantities of oxygen were available prior to the extensive period of experimentation.

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[14] From PX-308 it would appear that over 30 men were actively engaged in the application of oxygen to metallurgy.

Despite the Hellbruegge article previously discussed (DX-258E, p. 14), the testimony of Dr. Trenkler (PX-508, pp. 11901-04, 11929) relates that at the Gerlafingen works, Drs. Durrer and Hellbruegge had failed to remedy the difficulties of preserving the refractory lining. This was further confirmed by the Rinesch affidavit (PX-2A, pp. 79-80, 96-97), and the Hauttmann affidavit (PX-2A, pp. 88-92).

4. Secondary Considerations

While secondary considerations alone will not create patentability, *Hadco Products, Inc.* v. *Walter Kidde & Co.,* 462 F.2d 1265 (3d Cir. 1972), under *Graham* v. *Deare, supra,* certain secondary considerations may also be reviewed in arriving at a determination of obviousness. See also: *Jones Knitting Corp.* v. *Morgan, supra,* 285 F.2d 501 (C.A. 2, 1960).

Plaintiffs' 9xhibit 81A is a statistical compilation of steel production in the United States, based on figures contained in the Department of Interior's *Minerals Yearbook,* and shows that in 1955 total steel production in the United States was about 117 million short tons of which 105 million short tons were produced in open hearths while only 0.3 million short tons were produced in basic oxygen furnaces; that in 1965 total steel production in the United States was about 131 million short tons of which 94 million short tons were [26] produced in open hearth while 23 million short tons were produced in basic oxygen furnaces; that by 1969 total steel production in the United States was about 141 million short tons of which about 61 million short tons were produced in open hearths while 60 million short tons were produced in basic oxygen furnaces, and that in 1970 of a total production of steel in the United States of about 132 million short ton, 48 million short tons were produced in open hearths while 63 million short

tons were produced in basic oxygen furnaces.[15] Thus the rapid change in the method of steel production in the United States during a fifteen year period during which time production via the basic oxygen process surpassed production in the open hearth furnaces is clearly "persuasive" of the recognition of the importance of the invention.

Further lack of obviousness arises from the *skepticism* of McLouth when it constructed its basic oxygen furnace in Trenton, Michigan. Ivor Bryn an officer and Director of McLouth testified (PX-470, p. 1296) that "We weren't sure of the advantages when we made the decision to build it. That's the reason we were skeptical and put the duplex in." He then continued (PX-470, pp. 1297-1299):

> "Q. And I gathered from your statement that you were not sure at the time as to whether or not you would be able to get a product comparable with the product of the open hearth process?
> "A. That's right. That's the reason we spent the dough to make it possible to duplex or otherwise we wouldn't have thrown that dough out the window.
>
> [27] "Q. So far as McLouth's business is concerned at that time, I would take it that the steel made by the Bessemer process just wouldn't have been adequate to enable you to continue to supply your customers to whom you were selling at the time, right?
>
> "A. Bessemer steel as such, you are saying?
>
> "Q. Yes.
>
> "A. O.K. That's right, but that's another reason we put this duplex thing in. We thought Bessemer or the oxygen process would permit us to go to duplex, whereby we would be able to serve them with a product that in our opinion was satisfactory.
>
> "Q. Now, what particular feature of the Bessemer-made steel would have made it inapplicable or inadequate for your purposes, Mr. Bryn?

[15] The 1970 figures are derived from data compiled by the American Iron and Steel Institute.

> "A. High nitrogens.
>
> "Q. And were you afraid that you might possibly run into that same condition so far as the oxygen process is concerned?
>
> "A. We weren't afraid of that. We didn't know what we were getting into. We did not know what our sulphur problems were going to be, phos, or any of those things."
>
> • • •
>
> "Q. So as a consequence, as I understand it, you put in the duplexing equipment, at the outset?
>
> "A. That's right.
>
> "Q. And you later found that by this process it was not necessary to duplex?
>
> "A. That's right.
>
> "Q. And that you could get a steel of adequate quality without duplexing?
>
> "A. Right.
>
> "Q. Now, were you at that time aiming for a product of quality equal to or better than the quality of the open hearth product?
>
> "A. At that time our aim was to be as good.
>
> "Q. As good as open hearth?
>
> [28] "A. That's right."

In *Loom Company* v. *Higgins*, 105 U.S. 580, 591-92 (1881) the Supreme Court stated:

> "It may be laid down as a general rule, though perhaps not an invariable one, that if a new combination and arrangement of known elements produce a new and beneficial result, never attained before, it is evidence of invention. It was certainly a new and useful result to make a loom produce fifty yards a day when it never before had produced more than forty; and we think that the combination of elements by which this was effected, even if those elements were separate-

ly known before, was invention sufficient to form the basis of a patent."

The Court of Appeals for the Third Circuit in *Corning Glass Works* v. *Anchor Hocking Glass Corporation,* 374 F.2d 473, 476 (C.A. 3, 1967), *cert denied,* 388 U.S. 826 (1967) stated that:

> "The District Court held that the Corning patent is '. . . a basic and pioneering advance in glass and ceramic technology.' 253 F.Supp. 461 at 465. We believe that Dr. Stookey's discovery is, in every sense of the word, a 'pioneer' ---' . . . a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in the progress of the art, as distinguished from a mere improvement or perfection of what had gone before.' *Westinghouse* v. *Boyden Power Brake Co.,* 170 U.S. 537 at 561, 562 . . . (1898). *Where the court is confronted with such a pioneer patent liberality becomes the keynote of construction* requiring the court to give the patentee a wide breadth of protection in construing the patent claims and specifications . . ." (Emphasis supplied).

The defense of obviousness is further weakened by statements of men, highly skilled in the art and clearly recognized for their expertise, which are cited above and merely repeated for emphasis.

Dr. Chipman, former head of the Department of Metallurgy at M.I.T. testified (R. 576-77) that when he learned of the work of the patentees; he "was amazed" and "wondered if it could **[29]** really work this way with vertical blowing. . . . It was not my business to develop an oxygen process, but if it had been, I think at the time I would have thought it necessary to go to deep blowing at an angle. This would have been my approach at that time before I heard a description of the LD process."

Mr. Prince, an employee of Kaiser Engineers whose occupation is as a steel plant technician specializing in LD operations and practice testified (R. 3208-11):

> "Q. What was your reaction when you first heard about the LD process?
>
> "A. It seemed to me at that time rather an extravagant use of oxygen. I didn't think it was possible to melt scrap and refine pig iron using oxygen alone . . .
>
> I couldn't understand how by using oxygen alone you could make steel. I was familiar with the use of oxygen as part of the steelmaking process. . . . But a process which involved only a stream of oxygen onto a charge of molten iron and scrap, I couldn't understand at that time . . .
>
> "Q. To sum up on that point, would it be fair to say that on the state of your knowledge at that time, you just didn't believe it possible that this process would work?
>
> "A. No, I didn't believe it possible, Mr. Webb, at that time . . .
>
> It was something so new and so outside of my experience that it was very difficult to understand how they could complete a heat of steel using oxygen along in what amounts to a crucible . . .
>
> . . . to do the whole thing in one shot with a big stream of oxygen seemed at that time to me a little bit too much."

Dr. Elliott, a Professor of Metallurgy at M.I.T. testified in *McLouth* (PX-504, p. 6324) that when he first heard of the Suess process he was ". . . astonished to find that the use of oxygen could be accomplished successfully in such a simple **[30]** manner."

In *Cimiotti Unhairing Co.* v. *Am. Fu Ref. Co.,* 198 U.S. 399, 409 (1905) the Court held that the inventor ". . . has taken the step which marks the difference between a successful operating machine and one which stops short of

that point and that advance entitles him to the protection of a patent." Judge Coxe speaking for the Second Circuit in *Cimiotti Unhairing Co. et al.* v. *American Unhairing Mach. Co.*, 115 Fed. 498 (C.A. 2, 1902), which was cited with approval in the Supreme Court's opinion, stated, "Covert came nearer than any one else to a successful machine. He had but one more step to take and here he became bewildered and went astray."

Few, if any, inventions arise spontaneously from the minds of their inventors. Of necessity there must be some prior art upon which the novelty of the newly discovered matter rests. Thus it is that when one successfully creates that "advance" or "step" which differentiates the invention from the prior art, he becomes entitled to the protection provided in our Patent Law.

In view of the success of the patentees whereas all previous work had met with failure my belief that the present invention lacked obviousness is reinforced.

D. Double Patenting.

The defendant, relying on *Miller* v. *Eagle Manufacturing Co.*, 151 U.S. 186, 197 (1894), asserts that the patent in question is invalid because ". . . under the well-settled rule . . . two valid patents for the same invention cannot be granted either to the same or to a different party." And in support of its claim of double patenting, the defendant cites Cuscoleca patent number 2,741,555 (DX-22), and alleges that the claims of the Cuscoleca **[31]** patent are addressed to and cover the same invention as the claims of the Suess patent, and that the two patents are owned by a common entity. The latter patent issued on April 10, 1956, about 15 months prior to the Suess patent.

The Cuscoleca patent ". . . relates to a process for refining pig iron in a converter or other suitable vessel, in which oxygen or other oxidizing gases or oxygen-containing gas mixtures are blown against the bath surface from above and the heat quantity required for the process is produced by the reaction of the oxygen with the impurities in the molten pig iron bath." (Col. 1, lines 15-21). The specification continues, "It is accordingly a primary purpose and object of this invention to provide a process for the refining of primarily hot metal charge, that is, predominantly molten pig iron, with high purity gaseous oxygen in which controlled refining at substantially theoretical oxygen efficiency is accomplished." (Col. 2, lines 22-27). In its particulars, the Cuscoleca patent very closely resembles and it might even be said to parallel the Suess et al. patent. Some specific illustrations of these similarities will clearly demonstrate these parallelisms: using a surface blow of high purity oxygen thereby obtaining exceptionally high refractory life (Col. 2, lines 28-31); producing a controlled reaction thereby avoiding over-oxidation (Col. 2, lines 32-36); and providing a high purity oxygen refining process which is applicable to pig iron of varying chemical compositions resulting in the production of high quality steel (Col. 2, lines 37-53).

The Cuscoleca patent further teaches that there is an **[32]** approximate vertical impingement of the oxygen stream on the central portion of the bath surface (Col. 5, lines 37 to 45); that one should use high purity oxygen, i.e., at least 97 percent oxygen, but with at least 98 percent oxygen preferred (Col. 6, lines 38-45; Col. 11, lines 64-65); that the slag layer is initially displaced or penetrated by the oxygen jet itself (Col. 3, lines 37-40); that the pressure of the jet is such that deep penetration of the bath is avoided (Col. 3, lines 47-54); that the blast nozzle be spaced between 150 to 2000 mm. from the quiet bath surface, and preferably above 250 mm. through the operating ranges of nozzle pressures from 3 to 20 atmospheres; that utilizing the process results in confining the zone of direct oxygen reaction to the central portion of the bath (Col. 5, lines 69-

71); that the process produces a bath circulation toward and away from the centralized reaction zone (Col. 6, lines 71-75); that over-oxidation of the steel is avoided (Col. 6, line 75 to Col. 7, line 18); that the process promotes an early fluid slag which results in the reduction of phosphorus and sulfur (Col. 6, lines 49-66); and that by confining the zone of direct oxygen reaction to the central portion of the bath, the refractory lining is afforded substantial protection (Col. 5, line 69 to Col. 6, line 6). Thus, it would appear that there is considerable identity between the specifications of the Cuscoleca patent and the patent in suit. However, it must be borne in mind that the Cuscoleca patent was cited in the file of the Suess et al. patent, and that therefore, the examiner did not find Cuscoleca anticipatory.

[33] Counsel for the defendant argues that although the original Suess application and the continuation-in-part application were filed prior to the application of Cuscoleca, the fact that the Cuscoleca patent issued on April 10, 1956, several days prior to the issuance of the Suess et al. patent, makes it prior art. I cannot agree with the contention for it is the filing date and not the issuance date which controls the issue of priority.

> "An application for patent for an inventoin disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States by the same inventor shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application." 35 U.S.C. § 120.

In essence, where as here the applicants by specific reference term the application which eventuated into the

patent in suit, to be a "continuation-in-part" of the application filed, and where there has been no abandonment, the applicants are entitled to the benefit of the earlier filing date. *Stricker Indus. Supply Co.* v. *Blaw-Knox Co.*, 405 F. 2d 90, C.A. 3, 1968.

Thus, the immediate question for our consideration is whether or not an abandonment of the original application occurred prior to the filing of the continuation-in-part application. As previously stated, the continuation-in-part application was filed while claims 14 and 15 of the original application were still pending before the Patent Office. In addition, considerable analyses of the original application and the continuation-in-part application have been presented which **[34]** demonstrate that the same fundamental concept of blowing vertically from above, onto and below the central surface of the bath under such controlled conditions of oxygen pressure and lance height so as to produce a localized reaction zone spaced away from the refractory walls and creating high quality steel with minimal refractory damage, permeates both the original and the continuation-in-part application. Thus, there was no abandonment of the inventive concept and the patentees are therefore entitled to the earlier filing date of their original application. *Stricker Indus. supra; Application of Ornitz*, 376 F. 2d 330, C. A. 3 1967.

As was stated in *Acme Highway Products Corp.* v. *D. S. Brown Company*, 431 F. 2d 1074, 1078 (C.A. 6, 1970), *cert. denied* 401 U.S. 956 (1971).

> "It is well established that to come within the purview of section 120, a later application must (a) disclose an invention which had previously been disclosed in the manner provided in 35 U.S.C. § 112 in an earlier application; (b) be by the same inventory; (c) be filed before the abandonment of the prior application; (d) expressly refer to the prior application.

From all that has been presented before me, it is clear that the patentees fulfilled these requirements and come within the purview of § 120.

The defense of double patenting is to prevent an inventor from extending the life of his claims beyond the allowable seventeen year period, by filing additional applications claiming the same invention. *Van Heusen Products, Inc.* v. *Earl & Wilson,* 300 Fed. 922 (S.D.N.Y., 1924).

In order to validly invoke the defense of double patenting **[35]** the claims of the patents in question must claim substantially identical subject matter. *Miller* v. *Eagle Manufacturing Company, supra; Helen Russell Pierce* v. *Allen B. DuMont Laboratories, Inc.,* 297 F. 2d 323 (C. A. 3, 1961); *Application of Wilhelm E. Walles,* 366 F. 2d 786 (C.C. Pa., 1966).

It is further required that in order to establish double patenting, it must appear that the two patents were issued to the same applicants. *Van Heusen Products, Inc.* v. *Earl & Wilson, supra; The University of Illinois Foundation* v. *Block Drug Co.,* 133 F. Supp. 580 (E. D. Ill., 1955); affirmed 241 F. 2d 6 (C. A. 7, 1957); *cert. denied* 354 U. S. 922 (1957).

The primary contention under the defense of double patenting is that the claim of the Suess and Cuscoleca patent are addressed to the same invention.

The Cuscoleca patent contains six (6) claims, whereas Suess contains two (2) claims.

The two claims of the Suess patent are drawn in broad inclusive language of " . . . discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, to an extent to avoid material agitation of the bath . . . resulting in reaction of the oxygen with a portion of the iron and with oxidizable impurities of the bath in a localized reaction zone . . . resulting in refining

of the iron and gas evolution and . . . producing a circulatory movement in the molten metal . . ." Claim 2 specifies blowing with oxygen pressures of between 5 and 25 atmospheres above normal atmospheric pressure.

Contrast these claims with the claims of the Cuscoleca **[36]** patent the first of which claims "A process for refining molten ferrous metal by surface blowing with gaseous oxygen . . . substantially vertically downwardly onto the surface of said molten metal, said blast nozzle being spaced between 150 millimeters and about 2000 millimeters above the surface of the molten metal, and controlling the impingement of the oxygen jet on the surface of said molten metal such that the impact pressure of the blast heat on a reference surface spaced from the blast nozzle a distance equal to the distance of the molten metal surface from the blast nozzle is maintained below about 0.75 kg./sq.cm., and above about 0.02 kg./sq.cm., while supplying the oxygen at a rate sufficient to complete the refining in about 12 to 30 minutes." The second through fifth claims provide for blowing according to claim 1 but with variations in the impact pressure, and amount of solid ferrous metal scrap. The sixth and final claim includes the same control step except that it specifies that the "average impact pressure of the blast jet in the impingement area . . ." is maintained " . . . below about 0.75 kg./sq.cm. and at least about 0.1kg./sq.cm."

The Suess claims clearly do not specify the more limited operating parameters contained in Cuscoleca. In a much more limited fashion, Cuscoleca attempts to establish a closely controlled relationship between oxygen flow time, oxygen flow rate and impact pressure. Clearly, the more general Suess process does not contain such highly specific limitations.

Perhaps the degree of specific refinement of Cuscoleca over Suess is best summarized by plaintiffs' final argument in which counsel stated:

[37] "If you practice Cuscoleca, I think you probably would be practicing Suess, but the reverse is not true. This is the situation which you have when you have a basic patent and an improvement patent follows, a genuine basic patent; and an improvement patent may come along also. And if you are practicing some of those improvements, why, you probably would practice the basic invention without practicing the improvements. (FA, p. 197) [16]

That is, practicing the more general patent would include the practice of the more limited, specific patent, but, the reverse is not necessarily true.

Furthermore, a claim which is the same as, or for the same or substantially the same the subject matter as, a claim of an issued patent may not be made in any application unless such a claim is made prior to one year from the date on which the patent was granted." 35 U.S.C. § 135(b) Where patent applications are pending at the same time, disclosures of one could not be prior art as to the other *Application of Baird,* 348 F. 2d 974, (C.A. 3, 1965). Thus, at best one could consider the Cuscoleca application a "co-pending" application.

The defendant further alleges that the Cuscoleca and Suess patents are owned by a common entity.

At the time they made their patent application, Suess, Hauttmann, Trenkler and Rinesch were employees of VOEST; Cuscoleca, Grohs, Rosner and Kuhnelt were employees of Osterreichisch-Alpine Montangesellschaft (OAMG). Although VOEST and OAMG were ostensibly owned by different entities, it has been shown that at all relevant times these were a part of the nationalized Austrian steel industry (DX-230, pp. 15-16).[17]

[16] Transcript of record of final argument will be cited as "FA" (final argument).

[17] In his deposition (DX-230), Dr. Michaelis states that VOEST and OAMG were a part of the nationalized Austrian steel industry,

[38] At the time the original patent application was filed in the United States the VOEST group employed Attorneys Mock and Blum to prosecute their application, and the OAMG group retained Messrs. Singer, Sterm and Carlberg to prosecute their application. Subsequently, both VOEST and OAMG substituted Messrs. Campbell, Brumbaugh, Free and Graves which firm later became Brumbaugh, Free, Graves and Donahue to prosecute their applications in the United States. The fact that the ultimate prosecution of both applications fell upon the same firm of patent attorneys, without proof of sinister motives, demonstrates nothing more than a tribute to their competence in his field.

Because the defendant has failed to sustain its burden, it has failed to prove its defense of double patenting.

[39] *E. The Specification comports with Section 112.*

It is provided in Section 112 of Title 35, U.S.C., that:

"The specification shall contain a written description of the invention and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention . . ."

Thus as to the adequacy of the specification, the test to be applied is whether or not one skilled in the art of steelmaking could practice the invention from the disclosures contained in the patent.

Justice Strong, writing for the Supreme Court in *Mowry* v. *Whitney,* 14 Wall. (81 U.S.) 620, 644 (1872) stated:

but does not comment on the actual ownership of the two companies. Nothing was presented in the record here to conclusively demonstrate ownership.

> "The specification, then, is to be addressed to those skilled in the art, and is to be comprehensible by them. It may be sufficient, though the unskilled may not be able to gather from it how to use the invention. And it is evident that the definiteness of a specification must vary with the nature of its subject. Addressed as it is to those skilled in the art, it may leave something to their skill in applying the invention, but it should not mislead them."

Section 112 was thoroughly construed by the Court of Appeals for this Circuit in *Jones Knitting Corporation* v. *Morgan, supra.*, at pages 453-454 (CA3 1966):

> "Regardless of the fact that the term 'heat-insulating' may be one of degree, there is abundant evidence on this record taken as a whole that when one skilled in the art reads the Morgan Patent, he would be capable of producing the patented fabric and of determining the limits of the patent. As we interpret the statutory standard, this is all the inventor need show. 35 U.S.C.A. § 112.
>
> As succinctly stated by the Second Circuit in Georgia-Pacific Corporation v. United States Plywood Corporation, 258 F.2d 123 (2 Cir. 1958), **[40]** cert. den. 358 U.S. 884 . . . the requirement of 35 U.S.C.A. § 112 serves two primary purposes:
>
> '. . . those skilled in the art must be able to understand and apply the teachings of the invention and enterprise and experimentation must not be discouraged by the creation of an area of uncertainty as to the scope of the invention. On the other hand, the policy of the patent statute contemplates granting protection to valid inventions, and this policy would be defeated if protection were to be accorded only to those patents which were capable of precise definition. The judicial function requires a balancing of these competing considerations in the individual case.' (258 F.2d at 136)."

Georgia-Pacific v. U.S. Plywood Co., 258 F.2d 124 (C.A.2 1958), cert. den. 358 U.S. 884, 1958 in performing this balancing, teaches that:

> "'. . . patentable inventions cannot always be described in terms of exact measurements, symbols and formulae, and the applicant necessarily must use the meager tools provided by language, tools which admittedly lack exactitude and precision. If the claims, read in the light of the specifications, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the court can demand no more.'" (258 F.2d at 136) . . .

In the present case, a "know-how" agreement was entered into between Kaiser and J & L on August 8, 1956. Though the agreement was never introduced into evidence, its essence was to provide construction and "know-how." (PX-472 pp. 1188-89, 1198-99).

[41] In view of the facts that the teachings of the Schwarz and Miles patents were freely available in this country, and that J & L retains, and has for many years employed men of the highest skill in steelmaking, thus qualifying as a company highly skilled in that art, one wonders why J & L had to come to Kaiser for "know-how" if Kaiser had nothing new to sell. When presented with this question, counsel for J & L answered that Kaiser was retained to construct a new plant. The evidence, however, is much broader and shows emphatically that J & L sought basic oxygen application know-how at its Aliquippa plant, received instruction and written material, and sent its representatives to Linz, Austria, to learn first-hand how the Austrians applied the process.

> "Section 112 requires that the invention and the manner and process of using it must be described in full, clear, concise, and exact terms in order to enable a person skilled in the art to make and use the same. But these words must be reasonably interpreted and considered in the light of the evidence in the case and the nature of the invention. If the disclosure from the specifications and drawings is sufficient to enable a person of ordinary skill in the par-

ticular art to make and use the invention, that is sufficient." *Reeves* v. *U.S. Lamination Corp.*, 282 F.Supp. 118, 128 (E.D.N.Y. 1966), aff. 417 F.2d 869 (C.A.2 1969).

The disclosure need not convince one skilled in the art that the assertions are correct. *In re Robins*, 429 F.2d 452 (C.C.P.A. 1970). But, the statute merely requires that the disclosure be such as to enable one skilled in the art to practice the invention. *Application of Naquin*, 398 F.2d 863 (C.C.P.A. 1968); *Hadco Products, Inc.* v. *Lighting Corp. of America, Inc.*, 312 F.Supp. 1173 (E.D.Pa. 1970); reversed on **[42]** other grounds, 462 F.2d 1265 (C.A.3 1972) cert. denied, 409 U.S. 1023 (1972); *Carter-Wallace, Inc.* v. *Riverton Laboratories, Inc.*, 304 F.Supp. 357 (S.D. N.Y. 1969).

Since the specification is directed to those skilled in the art, it is not necessary that details which would be obvious to a person so skilled be revealed. *Application of Myers*, 410 F.2d 420 (C.C.P.A. 1969). Nor, need it be a "production specification." *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc., supra.* The question then is whether one skilled in the art could derive the final result from following the process. *Application of Grier*, 342 F.2d 120 (C.C.P.A. 1965). Thus, it is necessary that the *specification* make a meaningful disclosure to one skilled in the art which would enable him to practice the invention without the necessity of extensive experimentation. *Application of Diedrich*, 318 F.2d 946 (C.C.P.A. 1963).

The evidence presented before me clearly establishes that the specification of the patent in suit complies with this requirement of Section 112. Dr. Chipman testified as follows (R. p. 533):

"Q. Would you please tell us whether or not that patent discloses the features of the basic oxygen or LD process as you have described it and illustrate it in your charts?

A. It does."

Dr. Chipman further testified (R. p. 580):

"Q. Now, Doctor, referring again to the teachings in the patent, would you tell us whether or not those teachings that you have described in some detail are seufficient to enable one skilled in the art to utilize the process?

[43] A. Yes, in my opinion, they are.

Q. And in your opinion, would the teachings of the patent in suit which you have described be adequate to enable those skilled in the art to utilize the process for each of various sizes: 35, 80, 150, 200 tons, and so forth?

A. Yes, I see no great difficulty in that."

Mr. Prince testified as follows: (R pp. 3477-3482):

"Q. Now, are you familiar with the Suess et al., patent in suit, No. 2,800,631?

A. Yes.

Q. What does that patent teach you as one skilled in the art as to the principles of the process described therein?

A. It teaches me how to refine molten impure iron in the presence of a slag and in a refractory lined vessel by means of blowing with oxygen.

It tells me that the stream of oxygen must be directed vertically downwardly at substantially the center of the bath so that it goes through the slag and engages with the metal of the bath.

By doing this, part of the reactions take place with part of the iron of the bath and with the impurities in the molten charge, and this takes place without deep penetration and in the high temperature localized reaction zone, which is spaced away from the sidewalls and the bottom and in the upper regions of the bath.

In achieving this localized reaction zone, a circulation of the liquid bath is induced and those parts of the molten charge which are away from this localized reaction zone are brought to it and oxygen reacts

with them in this high temperature reaction zone; this all taking place in a central position in the upper regions of the bath whereby there is minimum damage to the refractory lining at the walls or at the bottom.

Q. What does it teach you as one skilled in the art as to the causes of circulation?

[44] A. The causes of circulation are due to the chemical reactions and the mechanical action of the oxygen jet plays a very minor part, and this I know because of the very great diminution in activity at the end of the blow when the carbon level is at a very low figure, and compared with earlier in the heat, the sounds and evidence of mechanical action of the jet are slight.

Q. Where do the reactions which you have spoken of which cause refining of the metal take place in accordance with the teachings of the patent? In other words, are they confined to this localized reaction zone or do they take place elsewhere in the bath or in the converter?

A. They take place elsewhere in the converter.

Q. Only or what?

A. No. The localized reactions zone is the center of the reactions of the oxygen stream with the bath, but there is developed a general boil and a reaction in all parts of the bath.

Q. You spoke about this diminution of the activity at the end of the heat or near the end of the heat. Does the patent specifically teach you that that takes place?

A. Yes.

Q. What does the patent teach to you as one skilled in the art as regards the criteria which a steelmaker can look at and see the extent of penetration of the oxygen jet into the bath?

A. It teaches to blow in such a way that a surface reaction only is not obtained, and in such a way that there is no excessive slopping during the process.

It also teaches that it is not necessary to blow deeply, by which an early fluid slag is difficult or impossible to achieve and by which phosphorus removal is not adequate.

Q. Well, my point is this, Mr. Prince. Are these things the steelmaker can determine?

A. Yes.

Q. In other words, he can look at the vessel and see whether he is getting an excessive amount of slopping, can he?

[45] A. Yes.

Q. And he can examine his steel and find out what the phosphorus removal is?

A. Yes.

Q. Can he look at the slag and tell anything about the progress of the heat or what is going on?

A. He can tell from the activity in the vessel and the signs from this activity if he is blowing according to the method described in the patent.

Q. And can he look at the refractories and tell whether he is getting excessive wear of these?

A. Yes.

• • •

Q. Are the teachings of the patent limited to vessels of any particular size, Mr. Prince?

A. No.

Q. To you as one skilled in the art, is the patent limited as to the size of the heats which may be blown?

A. No.

• • •

Q. To you as one skilled in the art, are the patent teachings limited in regard to the pressures and flows which can be used, bearing in mind, of course, the broad teachings which you have described earlier?

A. No.

Q. Are the teachings limited with respect to the bath depth or the diameter of the bath, bearing in mind the main teachings of the patent which you described a moment ago?

A. No, not bearing in mind the teachings in the patent.

Q. Are the teachings of the patent in suit sufficient to enable you as one skilled in the art to practice the LD or basic oxygen process of the patent in suit?

[46] A. Yes."

Dr. Elliott testified (PX-504, pp. 6173-74):

"Q. Would you, as one skilled in the art, with the teachings of the patent before you, have any difficulty practicing the invention taught by the patent utilizing heats of 30, 35 or 40 tons?

A. No. That patent teaches sufficient information so that one can design and operate such an installation.

• • •

Q. Would you, as one skilled in the art, with the teachings of the patent before you, be able to apply the process of the patent to making heats of 60, 100 or 150 tons?

A. Yes."

Chief Justice Waite stated in *The Telephone Cases*, 126 U.S. 1, 536 (1888):

"The law does not require that a discoverer or inventor, in order to get a patent for a process must have succeeded in bringing his art to the highest degree of perfection. It is enough if he describes his method with sufficient clearness and precision to enable those skilled in the matter to understand what the process is, and if he points out some practicable way of putting it into operation."

The testimony of the distinguished experts clearly reveals compliance with this requirement.

A patent specification is not a blueprint for the execution of a process, but rather is a general description of a process which serves to convey particular information to one skilled in the art so as to enable him to practice the invention or learn where his activity might infringe on the protected **[47]** area. In *Ansul Company* v. *Uniroyal, Inc.*, 448 F.2d 872 (C.A.2 1971) *cert. den.*, 404 U.S. 1018 (1972), the Court of Appeals cited with approval the determination of the trial court that the necessity for conducting experimentation or preliminary tests by one attempting to follow the teachings of a patent would not invalidate the patent provided that the experimentation involved was not unreasonable. That is, to require one skilled in the art to conduct certain experimental tests or to determine operational variables is not an unreasonable requirement.

The Suess et al. patent presents a novel concept in general terms. As is stated in the patent (col. 9, lines 12-20):

"In general, it may be stated that as the oxygen pressure and nozzle diameter are increased, the nozzle spacing is also increased, for example, as the capacity of the refining vessel and total charge is increased. Under these conditions, deep penetration of the molten metal bath is avoided, while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact is insured."

It is not the intention of patent law to require that a patent specification become a general production or operational manual. "Obviously, it is not necessary that an applicant be more specific than is required by Section 112, portion (A). Not every last detail is to be described, else patent specifications would turn into production specifications, which they were never intended to be. United States specifications have often been criticized as too cluttered with details to give an easy understanding of

what the invention really is." **[48]** *Application of Gay*, 309 F.2d 769, 774 (C.A.3 1962).

Thus, it would appear that where the specification is of sufficient clarity to permit one skilled in the art to practice the invention, the fact that a reasonable amount of experimentation is required of such a person, does not invalidate the specification under Section 112.

In reviewing the present patent, it appears that in addition to the general statement at col. 9, lines 13-17, the specification also speaks in general terms at col. 3, line 49 to col. 4, line 6.

> "It has been determined in application of the present invention to the refining of predominantly molten pig iron charges by means of high purity oxygen, that the jet blown onto the surface of the molten iron, as above described, under a relatively low static pressure at the point of origin, for example, at the overhung blast nozzle, of from 5 to 25 atmospheres (about 75 to 375 pounds per square inch), preferably at about 8 to 12 atmospheres (about 115-175 pounds per square inch), with the jet diameter at the point of origin or blast nozzle about 1 millimeter (1/25 inch) per ton of charge, and with the point of origin or blast nozzle spaced from the bath surface from at least 150 millimeters (about 6 inches) up to about 2000 millimeters (about 80 inches), produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat at a rate sufficient to provide the heat required for completion of the refining in a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, *avoidance* of over-oxidation (undue loss of iron to the slag), and *avoidance* of slopping. The process conducted under these conditions *avoids* a deep penetration of the oxygen gas into the molten bath which seriously impairs refractory life at the bottom of the refining vessel. In addition, the impingement area of the high purity oxygen on the central **[49]** portion of the bath isolates the refractory walls of the refining vessel from the extremely high temperatures which are developed by the direct reaction of the oxygen and the molten metal." (Emphasis added)

While of necessity, a process of this variability can only be described in terms of general operating parameters, the specification does conclude with one example designed to illustrate how in actual practice the conversion is completed (col. 10, lines 29-75):

> "A closed bottom converter of normally 30 tons (metric) capacity is charged with a total of about 36 tons of metal through an open mouth. The oxygen lance is inserted through the mouth of the converter to the adjusted distance above the metal converter to the adjusted distance about the metal surface. The diameter of the surface to the bath with such a charge is about 5 meters and the depth of the bath about 1 meter. A typical cycle of operations is given below on a time table basis . . ."

There then follows a detailed description of events from "0" hours to "0.42-0.45" hours at which time the steel is poured. Included in this description is the amount of scrap charged; the amount of pig iron poured from the mixer; the addition of fluxing materials, the "introduction of nozzle, oxygen jet initiated at a nozzle pressure of 10 atmospheres (147 p.s.i.) with a nozzle spacing above the bath of 1000 millimeters"; the addition of iron slag and limestone chips; the reduction of the oxygen pressure; the withdrawal of the nozzle; the sampling of the contents of the converter; the draw off of the slag; the addition of Spiegel iron; the stiffening of the remaining slag, and finally the pouring **[50]** of the steel. The example concludes with an analysis of the final product (col. 10, lines 68-75):

> "Final test analysis on pouring into ingot mold was: 0.07% C, 0.32% Mn, 0.022% P, 0.020% S, 0.0035% N. Oxygen consumption 1950 cubic meters. This oxygen

> consumption is about 54 cubic meters (measured at standard conditions) per ton and compares with a theoretical oxygen requirement of 51 cubic meters (measured at standard conditions), and therefore indicates an oxygen efficiency of 95%."

The patent specification therefore, in very general terms describes a process whereby pig iron can rapidly be converted into steel with a significant savings in both capital and operating costs. The example illustrates but one set of specific conditions under which the conversion can be successfully accomplished.

Chief Justice Waite stated in *The Telephone Cases, supra.*, at p. 536:

> "The law does not require that a discoverer or inventor, in order to get a patent for a process, must have succeeded in bringing his art to the highest degree of perfection. It is enough if he describes his method with sufficient clearness and precision to enable those skilled in the matter to understand what the process is, and if he points out some practicable way of putting it into operation."

Therefore, it is not necessary that a patentee describe all possible applications of his process, or all conditions under which it is to be utilized; all that is requested is that the specification convey with sufficient clarity the fundamental processes of the invention which would enable one skilled in the art to practice the invention, even though he might conduct reasonable experimentation to adapt the process to his **[51]** particular circumstances.

In his closing argument for the plaintiffs, one of the plaintiff's counsel, offered a simplistic example which illustrates this concept (FA p. 340):

> "The best cook in my family is my sister, of sainted memory. She used a Settlement cookbook. My other sisters used to complain very bitterly. They said her stuff came out much better than theirs did, when they all used the Settlement cookbook. One day they rebelled and they all descended upon her—she lived in a little town outside of Chicago—and they said, 'How come that our stuff is not as good as yours? Now we want to watch you.'
>
> Well, my sister then bakes whatever she did, and they watched it. She followed the Settlement cookbook. But she added another little piece of butter and a little more sugar, and another egg. And then she got a better product than they did. She never told them about that.
>
> Did that change the essential recipe?—No. She could not have done it without the Settlement cookbook. Those small variations do not upset a recipe. It is still a good recipe."

Thus, a small variation in the operation of the basic process does not alter its essence. It is merely a slight variation in response to the necessity or skill of the operator.

A further point which warrants brief discussion here, although it has been elaborated upon previously, concerns the specification teaching of avoidance of "deep penetration" (col. 3, line 46). "Expressions quite as indefinite as 'high' and 'substantial' in describing an invention or discovery in patent specifications and claims have been recognized by this **[52]** Court as sufficient." Eibel Process v. Minnesota and Ontario Paper, 261 U.S. 45, 66 (1923). See also, *Chicago Pneumatic Tool Co.* v. *Hughes Tool Co.*, 97 F.2d 945 (C.A.10 1938), cert. denied, 305 U.S. 643 (1938).

From the testimony here, I conclude that avoidance of deep penetration is meaningful to those skilled in the art of steelmaking. I therefore conclude that the specification is not indefinite and that it describes the process in full, clear, concise and exact terms which would enable one, skilled in the art of steelmaking to practice it. Further specifics are not required. *Corning Glass Works* v. *Anchor*

Hocking Glass Corporation, supra.; Continental Can Company, Inc. v. *Crown Cork & Seal, Inc.*, 281 F.Supp. 474 (E.D.Pa. 1967), vac. 415 F.2d 601 (PA3 1969) on other grounds *cert, den.*, 397 U.S. 914 (1970).

F. *The claims*

The defendant further alleges that the claims of the patent in suit fail to comply with the requirements of Section 112, which states:

> ". . . The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. A claim may be written in independent or dependent form, and if in independent form, it shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim."

[53] The specification of the patent in suit teaches that:

> "According to the process of the invention, the high purity oxygen jet is blown vertically, or approximately vertically upon the central portion of the surface of a bath of the molten metal, the jet having a diameter and static pressure at the point of origin, that is, at the blast nozzle or other jet producing means, and the point of origin (blast nozzle) being spaced from the bath surface, such that direct contact of the oxygen jet and the molten metal is established and maintained throughout the refining period *without deep penetration* of the molten metal bath by the jet. In so operating, the area of jet impingement is controlled to produce a relatively confined zone of direct oxygen to molten metal contact with respect to the total surface area of the bath . . . produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat at a rate sufficient to provide the heat required for completion of the refining in a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, *avoidance of over-oxidation* (undue loss of iron to the slag), and *avoidance of slopping*. The process conducted under these conditions *avoids a deep penetration* of the oxygen gas into the molten bath which seriously impairs refractory life at the bottom of the refining vessel. In addition, the impingement area of the high purity oxygen on the central portion of the bath isolates the refractory walls of the refining vessel from the extremely high temperatures which are developed by the direct reaction of the oxygen and the molten metal." (col. 3, line 36 to col. 4, line 6) (Emphasis added)

From the specification, it becomes clear that the process of the patent in suit consists of blowing extremely high purity oxygen or pure oxygen centally downward *onto and below* the surface of the molten metal bath so as to penetrate the fluid slag layer but only penetrate the molten iron to a limited extent. This lack of deep penetration insures an early fluid **[54]** slag which is essential for adequate phosphorus removal, prevents over-oxidation of the iron ore resulting in an increase in yield, and produces a relatively localized reaction zone spaced a substantial distance from the refractory walls. This latter condition prevents injury to the refractories *thereby* augmenting their useful life. However, the penetration must be more than a mere surface phenomenon to avoid undesirable slopping.

While the degree of penetration which will be deep enough to prevent slopping yet not so deep as to cause injury to the refractory or prevent the formation of an early fluid slag is described in general terms in the specification, the precise balancing of these variable conditions is left to the expertise of the steelmaker as his particular operating parameters and goals dictate.

Noting the above, it now becomes necessary to specifically focus attention on the claims, which by statutory mandate must follow the body of the specification.

It is provided in col. 12, lines 11-29:

"We claim:

> 1. Method of refining molten impure iron in the presence of a slag in a vessel having a refractory lining by blowing with oxygen, which comprises discharging a stream of oxygen *vertically* downwardly through the slag layer *onto and below* the surface of the bath at the *central portion* thereof, to an extent to *avoid material agitation* of the bath by the oxygen stream, the contact of the oxygen with the bath resulting in reaction of the oxygen with a portion of the iron and with the oxidizable **[55]** impurities of the bath in a *localized reaction zone* spaced a substantial distance from the refractory lining, the reactions in said zone resulting in refining of the iron and gas evolution and in the production of high temperature in the reaction zone away from the refractory lining, said reaction producing a *circulatory movement* in the molten metal, which circulatory movement brings those portions of the molten metal bath which are remote from the reaction zone into the reaction zone whereby those portions are subjected to said reaction with minimum injury to the refractory lining. (Emphasis supplied)
>
> 2. The gaseous oxygen process set forth in claim 1 in which the oxygen is blown into said vessel under pressure in a range between about five and about twenty-five atmospheres above normal atmospheric pressure."

It is the wording of the claims which caused the *McLouth* District Court to conclude that:

> "On the state of this record, this Court is obliged to conclude that the avoidance of deep penetration by the jet is not necessarily causally related to the claim of avoiding 'material agitation of the bath by the oxygen stream.' In other words, it appears to this Court that even deep penetration would avoid material agitation as defined by the plaintiffs . . . no such causal relation has been established in this record that would entitle plaintiffs to read the avoidance of deep penetration into the language of the claim referring to the avoidance of material agitation of the bath by the oxygen stream." (257 F. Supp. at page 426)

Based on the lack of connection between the concept of avoiding deep penetration as contained in the specification and the concept of avoiding material agitation as contained in the claims, Judge Freeman "reluctantly" reached the conclusion that the patent in suit was invalid.

Because the *McLouth* District Court erroneously believed that the essence of the Suess et al. patent was embodied in the **[56]** concept of avoiding deep penetration of the bath by the oxygen stream, it felt compelled to conclude that the claims of the patent did not incorporate this concept. In a suit in which the scope or interpretation of patent claims are in dispute, the entire patent history becomes relevant. *Waldon, Inc.* v. *Alexander Manufacturing Company,* 423 F.2d 91 (C.A.5, 1970).

A " . . . patentee is entitled to select his own language as long as his meaning was reasonably plain and specific." *Elipse Corporation* v. *Ford Motor Company,* 312 F.Supp. 646, 660 (N.D. Ill., 1969), modified on other grounds (C.A.7 1971); 452 F.2d 163 (C.A.7 1971); cert. denied, 406 U.S. 948 (1972); rehearing denied, 409 U.S. 898 (1972). Thus, in an effort to demonstrate the logical connection between these two concepts, the plaintiffs here presented the deposition of the patent examiner, Claude A. LeRoy (PX-1002), and the testimony of Byron Gardner, Esq., who had the primary responsibility for the prosecution of the patent before the Patent Office. While these have been discussed previously, a very brief summary is appropriate here because of their critical nature.[18]

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[18] On April 29, 1970 at the first post trial hearing, the defendant raised an objection that this testimony was immaterial and that it violated the Parol Evidence Rule. I considered that even if the pat-

In his deposition, Mr. LeRoy testified that he was the primary examiner when the Suess et al. patent was before the Patent Office for consideration; that the assistant examiner and the prosecuting attorneys were unable to arrive at a mutual agreement and requested an interview with him in his capacity as primary examiner; that the policy of the Patent Office is to avoid the use of negative language in the claims to the **[57.1]** extent such is possible; that as primary examiner, LeRoy believed that the language "avoid deep penetration" was not the proper wording for claims; that the concept of deep penetration was well understood in the art, and that as primary examiner he believed that it would be more appropriate to emphasize the inventive feature of a localized penetration; that while he did not remember who had suggested the use of the term "without material agitation" in place

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ent was a contract, the evidence here is merely explanatory of what occurred while the contract was being formulated.

The contractual nature of a patent is well documented in the federal judiciary, *Goodyear Dental Vulcanite Co.* v. *Davis*, 102 U.S. 222 (1880); *Texas Co.* v. *Anderson-Prichard Refining Corp.*, 122 F.2d 829, C.A. 10, 1941. Recognition of this status had inevitably involved simultaneous acceptance of the well-known contract rule that parol, or outside, evidence may be received to interpret the patent (or contract), but not to enlarge, diminish or vary the language, *Goodyear Dental Vulcanite Co.* v. *Davis, supra*, at page 227; *Van der Horst Corp.* v. *Chromium Corp.*, 98 F.Supp. 412, 420 (S.D. N.Y. 1951).

Though I have also considered the possible conflict between Patent Office Rule 1.2 and my allowance of evidence concerning patentees' negotiations with the Patent Office examiners, although they were not recorded verbatim in the file wrapper, the negotiations were referred to there (PX2A, at page 74). As was stated in Lavell Aircraft Corp. v. United States, 358 .2d 1005, 1007-1007 (Ct. Cl., 1966): "For purposes of determining whether or not an accused structure infringes a claim, the claim *must* be interpreted not only in light of the specification but *also with reference to the statements made to secure the allowance of patent claims.*" (citing cases) (Emphasis added). See also Opinion Compendium XVIII, pages 396-397.

of "avoid deep penetration" he did feel that the former statement was a more positive expression of the concept; and that he believed that there existed an identity of meaning between the phrases "material agitation" and "turbulence". While it is difficult to understand how the term "without material agitation" is any less negative than the concept of "avoid deep penetration", we nevertheless have here the unbiased and uncontradicted testimony of the primary examiner that in his opinion one was less negative than the other, and that there existed in his mind a synonymity between these two terms.

At the hearing held here on April 29, 1970, Attorney Byron Gardner testified that he had the primary responsibility for the prosecution of the Suess et al. patent before the Patent Office; that on May 1, 1957, a meeting was held between counsel for the prosecutor, and members of the Patent Office staff; that in the presence of the primary examiner, Mr. LeRoy, and an assistant examiner, the prior art and especially the Miles patent were discussed; that the contents of the Rinesch affidavit were discussed; that the examiner considered the invention to **[58]** be "a remarkable improvement" but that he did not like the language in the claims; that because of the equivalency of the rate of blowing and the height of the nozzle, the examiner suggested modifying the claim to provide "to such an extent—without material agitation"; that the primary examiner, Mr. LeRoy, interlineated those words in the claims; that the distinction was one of language rather than one of substance; that Mr. LeRoy believed that the expression "without material agitation" was a more definite limitation and better defined the invention than the expressions "avoidance of deep penetration" or "without deep penetration"; that the examiner indicated that the patent would issue based on the modified claims; that he prepared the amended application which was filed on June 11th; that at a further meeting at the Patent Office on June 13, 1957,

at which he was not present, further changes in the claims were made; that these changes were made in a supplemental amendment, and that after several slight informalities were attended to, the patent issued.

The testimony presented at the second post-trial hearing held on September 7, 8 and 9, 1971, on the issue of collateral estoppel has been thoroughly set forth previously. However, because the testimony of the expert witnesses ly critical at this juncture, it warrants repetition.

The witnesses called were David L. Ladd, lawyer and former commissioner of patents from 1961 to 1963; William E. Schuyler, Jr., a patent lawyer and a former commissioner of **[59]** patents from 1969 to 1971; and Robert B. Larson, a patent attorney and a former President of the American Patent Law Association in 1960-1961, and following that Chairman of the National Council of Patent Law Associations. On the question of collateral estoppel, Dr. John F. Elliott, Professor of Metallurgy of the Massachusetts Institute of Technology, who had testified as an expert at the *McLouth* trial, attempted to demonstrate the lack of technical understanding of the *McLouth* Courts.

The first witness, Mr. Ladd, testified that the Rinesch and Hauttmann affidavits (PX-2A) were included in the file history and would not have been obvious to anyone until the patent was issued, because until that time the entire contents of a file are unavailable to the public; but that upon issue, the entire file wrapper record becomes public and nothing could possibly be obscured in the file (CE pp. 60-62), even though such an obscurity was determined to exist by both the D.C. (257 F.Supp. at 431) and the *McLouth* Court of Appeals (400 F.2d at 50). He testified further that the examiner in the Patent Office ordinarily consults the specification and the file wrapper in order to precisely ascertain the meaning of particular terms (CE pp. 70-71); that the Schwarz patent was voluntarily brought to the attention of the Patent Office (CE p. 89); that cancellation of a phrase and substitution of another is not an abandonment of the original concept (CE p. 113); and that the record disclosed that "the Examiner was aware of **[60]** and applied the statutory provision of definiteness" (CE p. 156).

The testimony of William E. Schuyler, Jr., who served as the Commissioner of Patents during a term from 1969 through 1971, was in a large measure cumulative of Mr. Ladd's testimony. He did testify, however, that the final Suess claims did not constitute an abandonment of the earlier language, but rather represented a more precise statement of the claims (CE p. 186); that Claim No. 16 which spoke of avoiding deep penetration was still pending when the new claims and affidavits were filed (CE p. 188); that the final terms of a patent are gradually arrived at through a give and take negotiation process between the examiner and the applicant (CE p. 189); that a failure to list Schwarz in the reference cited at the end of the patent, was not indicative of failure by the examiner to consider the Schwarz patent (CE p. 192); that a change in the language of a claim does not constitute an abandonment of the concept (CE p. 205); that "Abandonment of language and abandonment of concept are two different things" and that in his expert opinion the applicants changed the language but not the concept (CE p. 231).

Robert R. Larson, patent attorney and President of the American Council of Patent Law Associations during 1960-1961, testified that in construing and interpreting a patent it is necessary to consider its entire file wrapper history (CE pp. 303-305); that when claims are rewritten an abandonment **[61]** does not necessarily occur; that "The mere rewriting of a claim with the use of different phraseology in and of itself certainly does not constitute an abandonment of what was previously claimed" (CE p. 307); that where the file wrapper under certain circum-

stances indicates an abandonment, that would be different, "But mere language is not" (CE p. 307).

When asked:

> "Q. Where new claims, however, are submitted after the cancellation of the claims and there is nothing in the file history to indicate an intent to abandon, do the cancelled claims and the submitted new claims give rise to this matter of abandonment?
>
> A. Oh, no, certainly not." (CE p. 307-308)

Mr. Larson testified that at the time the patentees canceled their original claims Nos. 1 through 4, they submitted Claim 12 which spoke of avoiding deep penetration. This showed the continuity of the concept and lack of any attempt to abandon it (CE pp. 317-318). At the time the supplemental amendment was filed on June 11, 1957, Claims 15 and 16 were still in the application. Then the prior claims were canceled and new claims 17 and 18 substituted therefor (CE p. 319-320). By the amendment filed on June 11, 1957, the language of Claim 17 was changed to avoid the negative limitations (CE p. 325); and since new matter cannot be introduced in an application by means of amendment, it can be assumed that the amended claims did not in the view of the examiner introduce any new matter (CE p. 330).

[62] This critical evidence was not available to the *McLouth* courts for their consideration. While it is true that the *McLouth* District Court allowed the plaintiffs broad latitude in presenting evidence, the plaintiffs now contend that because the issue of file wrapper estoppel was not raised in the pleadings or the pretrial or trial proceedings and did not arise until the trial judge filed his opinion incorporating the doctrine of file wrapper estoppel, that they were unable to present these critical matters.[19]

[19] The plaintiffs do not dispute the *McLouth* District Court's right to raise the doctrine of file wrapper estoppel *sua sponte*, but rather claim that they were not prepared to rebut this defense because it was not raised until after the trial was completed.

Thus it can be seen from the additional evidence that the plaintiffs did not intend to abandon the concept of avoiding deep penetration. I surmise that if this evidence had been presented before the *McLouth* District Court as fully as it has been presented before me, the *McLouth* Courts might very well have reached a different conclusion.

As the Court said in *Schriber Scrath Co.* v. *Cleveland Trust Co., supra,* at pages 217-218:

> "The claims of a patent are always to be read or interpreted in the light of its specifications . . . and we may assume that if in the present case the specifications and claims of the patent were to be interpreted without reference to its file wrapper history,
> **[63]** the webs referred to in the claims are the webs described in the specifications as capable of bending in cooperation with the slotted piston guides or skirts so as to compensate for thermal expansion and so supply the element of webs laterally flexible which was wanting to Gulick and to Maynard. But the particular invention to which the patentee has made claim in conformity to the statute is not always to be ascertained from an inspection of the specifications and claims of the patent alone. Where the patentee in the course of his application in the patent office has, by amendment, cancelled or surrendered claims, those which are allowed are to be read in the light of those abandoned and an abandoned claim cannot be revived and restored to the patent by reading it by construction into the claims which are allowed."

Therefore, by this language the Supreme Court made it clear that the claims of a patent are not to be interpreted in isolation but rather in reference to the entire history of the patent prosecution, and especially in view of the prior rejected claims. *Graham* v. *John Deere,* 383 U.S. 1 (1966); *Schmidinger* v. *Welsh,* 383 F.2d 455 (C.A. 3 1967), *cert. denied,* 390 U.S. 946 (1968). Furthermore, the United

States Court of Appeals for the Third Circuit has stated that "The law is settled that a patent should not be struck down or its claim unnecessarily limited where a reasonable construction of the specifications and claims will protect the invention." *Corning Glass Works* v. *Anchor Hocking Glass Corp., supra,* at page 478.

It is, therefore, imperative that an examination of the file wrapper history be made.

[64] **File Wrapper History**

On January 16, 1951, an original application (PX-2B) providing a "Method of Carrying Out Melting Processes" by the "treatment of metallic or metal-containing materials with oxygen-containing gases and which ". . . has particular relation to a process of this type, in which fusable materials are treated at high temperatures with said gases," was filed in the Patent Office.[20] The application continues,

> "The main object of the present invention is to provide a process . . . in which, owing to the particular conditions of the invention, the walls of the apparatus used in carrying out the process, are protected from undue corrosion by excessive temperatures and chemical reactions taking place at such temperatures.
>
> Another object . . . is to carry out the treatment of molten materials at high temperature with oxygen-containing gases in such manner that reaction of oxygen with ingredients of the molten bath, results in a beneficial circulation of the molten material . . ." (PX-2B, p. 1).

The specification recognized the necessity for such a procedure because of the limited life of the refractory lining which excited when the prior art was practiced (PX-2B, p. 1). The application further states (p. 2):

[20] All references in this part of the discussion will be to the pages in the original application. (PX-2B)

> "It has now been found that by suitable arrangement of the nozzle or the like, used for the introduction of gases, in combination with a suitable design of the device, in which the process is carried out and the use of certain predetermined amounts of materials to be treated in one batch, a very efficient protection of the refractory lining of the device, can be obtained."

[65] By starting with a suitable ratio of depth of bath to surface area, and applying the stream in a vertical or near vertical direction, a down-in-center circulation is achieved. The practice of blowing under a low pressure of between 5 and 25 atmospheres through a 15-35 mm. diameter nozzle, brings about a sufficiently high reaction velocity without deep penetration of the gas into the molten bath and the creation of a high quality finished product. (p. 3).

The application further speaks of the creation of a "local reaction between the oxygen and the carbon present in the iron . . ." (p. 3), and alleges another advantage of the process, i.e., ". . . the fact that deoxidizing agents can be dispensed with, means that refining with oxygen takes place without an excess of oxygen, which would be a harmful effect on the properties of steel." (p. 4).

Thus, in the original 1951 application we see the emergence of the dominant themes of blowing from above vertically upon the central bath surface at a sufficiently high pressure to insure sufficient reaction velocity, yet not so strong as to interfere with the down in center circulation. Furthermore, following the teachings of the application, a localized reaction zone is created, and at the same time adequate protection for the refractory linings is provided. Appended to the directions was the conclusion that blowing as directed "brings about a sufficiently high reaction velocity without deep penetration of the gas into the molten bath." (p. 3) **[66]** This language, in similar form, permeates the entire Suess et al. application.

The original application concluded with 12 claims the first of which is most graphic and speaks of blowing onto the center surface of the bath thereby creating a downward circulation (p. 10). The remaining claims repeat the general theme of creating a down in center circulation and provide specific examples (p. 10-12). On June 25, 1951, the Patent Office rejected all claims citing amongst other reasons, the Chiswik patent (p. 15-16). On December 14, 1951, an amendment was filed which made small changes in language (p. 17-19), and specifically stressed, ". . . circulation of the molten mass which is a fundamental feature in the applicant's invention . . . such circulation does not occur unless it is deliberately brought about by corresponding operating conditions." (p. 18)

On June 26, 1952, the entire amendment was rejected for reasons which included indefiniteness and lack of invention over Chiswik (p. 20-21). On December 22, 1952, additional amendments to the claims were made, which contained slight changes in language but nothing of major significance (p. 23-25). A supplemental amendment was filed on February 20, 1953, which spoke of down in the center circulation (p. 26-29). These amended claims were rejected on August 20, 1953, as failing to define the invention over Chiswik, Lane, Brassert and Miles. In that rejection it was stated that the application should be prepared for final rejection (p. 30-32).

[67] On February 15, 1954, an amendment and new claim 13 were filed. This claim likewise spoke of a downward circulation (p. 33). All thirteen claims were rejected over Chiswik on September 20, 1955, in the notice of final rejection (p. 39).

A Notice of Appeal was filed on March 21, 1956 (p. 42). However, on March 23, 1956, an amendment was filed which canceled all claims and at the same time added claims 14 and 15 (p. 43). Claim 14 stated:

> "A gaseous oxygen process for producing steel from a molten predominantly pig iron-containing metal charge containing oxidizable impurities in a refractory-lined converter having a bottom merging into substantially vertical side walls, said charge having a slag cover, and in which the heat required for the refining is produced by the reaction of oxygen with the oxidizable impurities in the metal, which comprises blowing a jet of high purity oxygen substantially vertically *onto a restricted impact area of the surface of the molten metal charge* in said converter from a restricted nozzle having an orifice diameter between about fifteen and about thirty-five millimeters, said impact area being located directly beneath said nozzle orifice and being spaced at the greatest possible distance from the side walls of the converter, maintaining the nozzle orifice spaced a substantial distance above the said surface and within the converter, and feeding the oxygen from said nozzle orifice at a relatively low pressure of between about five and about twenty-five atmospheres above normal atmospheric pressure, the total volume of oxygen supplied during refining being about 100m³ per ton of molten steel, the *pressure, orifice diameter and nozzle opening being such as to avoid deep penetration* of the oxygen jet into the molten metal . . ." (pp. 43-44) (Emphasis supplied).

Claim 15 contained a specific ratio of depth to diameter of the molten charge.

[68] By notice mailed April 9, 1956, claims 1 through 13 were canceled, and claims 14 and 15 were rejected (p. 48). Thus, no claims were allowed. On June 4, 1956, the United States Patent Office Board of Appeals dismissed the appeal for failure to file a brief (p. 86), and specifically, by letter mailed June 22, 1956, the Patent Office stated that "Since no claims were allowed, the case stands abandoned." (p. 7)

However, before this abandonment, and closing of the original application on November 16, 1955, the applicants filed a continuation-in-part application.[21] The specification

[21] All references in this section of the discussion will be to the pages of the applicants' continuation-in-part application, PX-2A.

of the continuation-in-part application which eventually resulted in the issuance of the patent in suit states:

> "This invention relates to a process for the treatment of metallic or metal-containing materials with oxygen-containing gases, preferably high purity oxygen, and has particular relation to a process of this type in which fusible materials are treated at high temperatures with said gases. Still more particularly, the invention relates to a process for the refining of molten metal with high purity oxygen blown downwardly onto the surface of a bath of molten metal." (p. 1)

Thus, in its opening words the specification succinctly recites the scope of the application, i.e., *a process for the manufacture of molten metals by treating the cruder ores with high purity oxygen blown downwardly onto the surface of the molten metal bath.* From this point onward, the specification **[69]** teaches how to apply the oxygen stream so as to (1) create a localized reaction zone, (2) create the down in center circulation, (3) preserve the life of the refractories, and (4) produce a satisfactory end product. It teaches that in order to achieve success, one must avoid deep penetration of the bath by the oxygen stream.

It is accordingly one of the main objects of the present invention to provide a process for refining molten metals by surface blowing with high purity oxygen, in which, owing to the particular conditions employed, the refractory walls of the apparatus utilized . . . are protected from undue corrosion by the excessively high temperatures developed and the chemical reactions taking place at such temperatures." (pp. 4-5)

"Another object of the present invention is to carry out the treatment of molten metals, and other molten materials by surface blowing with high purity oxygen in such a manner that the reactions of the oxygen gas with the constituents of the molten bath and the resulting high temperatures, to the extent possible, are limited to an oxygen jet impingement area removed from the refractory lining of the reaction vessel." (p. 5)

Amongst the further objectives claimed are: (1) achieving high theoretical oxygen efficiency (p. 5); (2) obtaining exceptionally high refractory life (p. 5); (3) preventing over-oxidation of the bath (p. 5-6) and (4) producing excellent quality steel at high production rates (p. 6).

[70] In practice, "the high purity oxygen jet is blown vertically, or approximately vertically upon the central portion of the surface of a bath of molten metal . . . such that direct contact of the oxygen jet and the molten metal is established and maintained throughout the refining period without deep penetration of the molten metal bath by the jet. In so operating, the area of jet impingement is controlled to produce a relatively confined zone of direct oxygen to molten metal contact with respect to the total surface area of the bath." (pp. 7-8).

The specification then teaches that the pressure at the point of origin should be between 5 and 25 atmospheres, and preferably 8 to 12 atmospheres (p. 8); that the jet nozzle should be about 1 millimeter (1/25 m.) in diameter per ton of charge, and spaced at least 150 to 2,000 millimeters (6 to 80 inches) from the bath surface (p. 8). This results in "refining in a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, *avoidance of over-oxidation* . . . and *avoidance of slopping*. The process conducted under these conditions *avoids a deep penetration of the oxygen gas into the molten bath* which seriously impairs refractory life at the bottom of the refining vessel." (p. 8) Thus, once again we observe the specific instructions of how the blowing should be conducted, and superimposed on these conditions is the outside limitation or cautionary instruction **[71]** to avoid deep penetration. The latter instruction being specifically directed to one skilled in the art of steelmaking in order to

augment the protection afforded the refractory lining it is taught that the ratio of the depth of the molten bath to the surface area should be between 1:5 and 1:28 (is in terms of ratio depth to diameter between 1:2.5 and 1:19). (p. 9) The specification further expresses the belief that applying the oxygen jet approximately vertically at the central portion of the bath surface brings about the desired down in center circulation (p. 10), enabling continuation of the reaction in a localized reaction zone (p. 10). Furthermore, it is taught that this desired circulation is augmented by the strong boil resulting from CO formation as the result of the vigorous carbon combustion (p. 11).

"The oxygen jet thus contacts the emulsion of bath and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly although the oxygen jet does not penetrate deeply into the molten metal bath and is confined to an impingement area at the central portion of the bath surface." (p. 11) Thus, once again one is reminded that observance of the instructions insure the cautionary limitation of not deeply penetrating the bath by the oxygen stream.

By so restricting the reaction zone the vigorous boil resulting from the carbon combustion "is opposed by the pressure of the oxygen jet only in the area of impingement" **[72]** (p. 11) and the localized endothermic reaction thus produced restricts the area in which the highest temperatures are obtained to the central surface area of the bath, and thereby provides "a maximum measure of protection to the refractory lining of the refining vessel." (p. 11)

A characteristic of the confined reaction zone at the central portion of the bath surface is the generation of an early fluid slag which is highly oxidizing (p. 14), and provides "an accelerated rate of phosphorus and sulfur removal" (p. 15) which is highly desirable in the production of high quality steel.

On page 23, a specific illustration is provided in which "30 ton converters charged to 35 to 36 tons, oxygen pressures at the blast nozzle of about 8 to 10 atmospheres and oxygen jet or blast nozzle diameters of from about 27.5 to 35 millimeters (1.1 to 1.4 inches) with nozzle spacings varying from 25 to 50 inches (about 650 to 1250 millimeters) have been used, the preferred spacing being from 30 to 40 inches (about 750 to 1000 millimeters). In general, it may be stated that as the oxygen pressure and nozzle diameter are increased, the nozzle spacing is also increased, for example, as the capacity of the refining vessel and total charge is increased. Under these conditions, deep penetration of the molten metal bath is avoided, while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact is insured." (p. 23)

[73] Once again we observe that we are told that if one follows the teachings of the specification, deep penetration of the bath by the oxygen jet is avoided. So we see that deep penetration is not a teaching of the patent but rather an intermediate result which one achieves when he observes the teachings of the specification.

As filed, the continuation-in-part application contained 15 claims, the first four of which are of specific concern to us.

In the first claim the applicant spoke of

> "A process for the refining of predominantly pig iron-containing molten metal with high purity oxygen gas, which comprises blowing a jet of high purity oxygen gas approximately onto the surface of a bath of said molten metal substantially at the central portion thereof, the point of origin of said oxygen jet being spaced from the bath surface, and the jet having a diameter and static pressure at the point of origin such that a relatively confined zone of direct oxygen to molten metal with respect to the total bath surface area is established and maintained while avoiding deep

penetration of the molten metal bath by the jet . . ." (p. 31).

The second claim spoke of

> "blowing a jet of high purity oxygen approximately vertically onto the surface of a bath of said molten metal having a lime-containing slag cover, the point of origin of said oxygen jet being spaced above the bath surface, and the jet having a diameter and static pressure at the point of origin such that the slag layer is initially displaced to establish direct contact of the oxygen jet with the molten metal while avoiding deep penetration of the molten metal by the jet, and controlling the area of impingement of the jet on the bath surface such that a relatively confined zone of direct oxygen-molten metal contact with respect to the total bath surface area is established and maintained . . ." (p. 32).

[74] The third claim speaks of a process comprising

> "blowing high purity oxygen gas approximately vertically onto the surface of a bath of said molten metal substantially at the central portion thereof, the jet impinging on the bath surface under such conditions that deep penetration of the molten metal by the jet is avoided, and a relatively confined zone of direct oxygen-molten metal contact is established and maintained . . ." (p. 33).

The fourth claim refers to refining

> "with high purity oxygen which comprises blowing a jet of oxygen approximately vertically onto the surface of a bath of said molten metal substantially at the central portion thereof to establish and maintain a relatively confined zone of direct oxygen-molten metal contact with respect to the total bath surface area without deep penetration of the bath by the jet . . ." (p. 33).

The remaining claims contained specific illustrations of the application of the process sought to be patented.

In a letter mailed June 14, 1956, the Patent Office rejected the claims as unpatentable over the patents of Brassert, Chiswik, Cuscoleca and Miles. In addition, the claims were rejected on the ground of multiplicity and as being insufficiently differentiated (pp. 58-60).

In a response dated December 7, 1956, which was filed December 10, the applicants canceled claims 1 to 10 and added a new claim 16 which to a large extent corresponded with claim 14 of the original application (pp. 65-69).[22]

[75] A supplemental amendment filed June 11, 1957, added claims 17 and 18 (pp. 72-77). The latter claims eventuated into the two claims of the patent as issued. Claim 17 clearly spoke of "discharging a stream of oxygen vertically downwardly against the surface of a bath of the molten iron at the central portion thereof without material agitation of the bath by the oxygen stream . . . in a localized reaction zone spaced a substantial distance from the refractory lining . . ." (pp. 72-73).

In the remarks appended to the application, it is stated, "The claims of the application are cancelled and new claims 17 and 18 are substituted therefor in view of the discussion with the Examiner on May 1, 1957." (p. 74)

Included in this application were the Rinesch and Hauttmann affidavits (pp. 78-97). In his affidavit, Rinesch reveals familiarity with the work of Schwarz and Miles (p. 79); that the earlier experimentation sought to employ deep penetration (p. 79); that proceeding via the prior art did not produce satisfactory results (p. 80); that on June 22, 1949, they started a new series of experiments in which the jet did not penetrate deeply (p. 81); and that proceeding in this manner satisfactory operations were obtained (p. 81). Rinesch attributed this success to:

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[22] It will be remembered that claim 14 of the original application was filed on March 21, 1956.

> ". . . a limited center of reaction . . . created in the surface layer of the bath by blowing oxygen onto the surface through a nozzle which is placed at a considerable vertical distance from said surface . . . **[76]** In the aforementioned center of reaction, oxygen reacts with iron and with the elements accompanying the iron, such as silicon, manganese and carbon. Thereby, a slag is created which is rich in oxides and heat is set free. This center of reaction is hotter than the rest of the bath and the reaction velocity is very high therein. The iron which in the field of reaction was freed from the elements accompanying it has a higher density than the crude iron and sinks to the bottom of the converter. This movement is aided by evolution of gas to that the molten iron begins to circulate in the converter." (p. 82)

Rinesch concludes that steel of satisfactory purity cannot be obtained with deep penetration, and that deep penetration creates uncontrollable turbulence in the bath (p. 83).

Hauttmann stated that the work of Schwarz and Miles was known to him (p. 89); that the latter patent intended to carry oxygen throughout the bath by the agitation or stirring produced by the deeply penetrating jet (p. 89); that after experimentation, the patentees selected blowing conditions whereby the stream of oxygen did not "agitate or stir the bath materially" (p. 90); that the patentees determined "that a satisfactory refining operation of the entire bath could be obtained so long as we relied mainly upon induced circulation due to a localized reaction center as distinguished from relying upon the stirring action of the oxygen jet penetrating deeply into the bath" (p. 90); and that:

> "I am convinced that an essential characteristic of our method is that a limited center of reaction is created in the bath by blowing oxygen onto the surface through a nozzle which is placed at a considerable vertical distance from said surface, said center of reaction being spaced laterally from the side walls and vertically above the **[77]** bottom wall substantially in the surface layer and that agitation such as is caused by the deep penetration of the jet according to the methods of the prior art, together with injury to the lining, and interference with the refining action thereby are avoided." (p. 91)

In an amendment filed July 11, 1957, slight changes in the specification were made (p. 104-105). On July 23, 1957, the patent issued.

The patent in suit speaks of blowing centrally, vertically onto and below the surface of the bath under controlled conditions of oxygen pressure. If one follows the teachings of the specification one may anticipate steel comparable in quality to open-heart steel and also preservation of the refractory linings. Furthermore, the specification informs an individual skilled in the art of steelmaking, that in following the patent instructions he avoids deep penetration, i.e. he avoids the unsuccessful practice of the prior art.

The claims likewise speak of blowing vertically and centrally through the slag layer onto and below the surface of the bath creating a localized reaction zone spaced a substantial distance from the refractory lining. If one skilled in the art heeds the claims, it becomes apparent that he avoids the prior **[78]** art and produces open-hearth quality steel while preserving the refractories. To an individual skilled in the art, the vertical and central blowing onto and below the surface creating a localized reaction zone, by implication limits the possible oxygen pressure. Too great a pressure prevents the reaction zone from being localized, and too slight a pressure leads to slopping (R.542, 820-21). To such an individual, the relative scope of the claims is very definite. Furthermore, the claims clearly instruct that the method claimed avoids the material physical agitation of the prior art.

Thus it would appear that the term "avoidance of deep penetration" or "avoidance of material agitation" are surplusage. One cannot blow vertically, centrally onto and below the surface creating a localized reaction zone, and at the same time penetrate deeply or materially agitate the bath. The concepts are mutually exclusive (R. 570), but cautionary.

The defendant argues that "onto and below" is not discussed in the specification. However, the testimony of Dr. Chipman [79] (R.540-41) and the specification (col. 1, line 24) show the fallacy of the allegation.

In addition the language of the claims such as "to an extent" is also relative, but this is not fatal, because the law does not require identity of words but that the concept be defined from the specification as an entity. *Eibel Process* v. *Minnesota and Ontario Paper,* 261 U.S. 45, 65-66 (1923) In *Boyle* v. *Harris-Thomas,* 18 F.Supp. 177, 181 (D.C.Mass. 1937) it was stated, "The patentee is not bound to use in his claims the precise phraseology with which he sets forth the invention in his specification." See also: *Aerosol Research* v. *Scovill,* 137 U.S.P.Q. 701 (N.D. Ill. 1963) modified on other grounds, 334 F.2d 751 (C.A. 7, 1964).

As has been set forth above, the critical parameters set forth in the specification were carried over into the claims.

As to the depth of penetration, both Dr. Chipman (R. 540-41, 545-47) and Dr. Elliott (PX-504, pp. 6168-70) testified that as individuals skilled in the art, they could understand the expression. Furthermore, Mr. LeRoy also stated (PX1002, p. 8) that deep penetration was understood in the art. See: *Eibel Process* v. *Minnesota and Ontario Paper, supra; Jones Knitting* v. *Morgan, supra.*

[80] When read in light of the specification, to one skilled in the art of steelmaking, the claims are sufficiently precise to fulfill the requirement of law. For this reason, it

appears that the plaintiffs have fulfilled their statutorily imposed obligation of setting forth the subject matter of their invention so that those skilled in the art can fully understand the scope of the patent. *Graham* v. *Deere supra; United States* v. *Adams, supra; Schmidinger* v. *Welsh, supra.*

G. Lack of the necessary statutory oath

It is provided in 35 U.S.C. § 115 that:

> "The applicant shall make oath that he believes himself to be the original and first inventor of the process, machine, manufacture, or composition of matter, or improvement thereof, for which he solicits a patent . . ."

The defendant alleges that the application lacks the oath required by Section 115. With the original application filed on January 16, 1951, an oath stated:

> "Being duly sworn, I, Theodore Edward Suess, depose and say that I am a citizen of Austria residing 45 Scheibenpogenstrasse, Linz—Spallerdof, Austria; that I have read the foregoing specification and claims and I verily believe I am the original, first, and sole inventor of the invention or discovery in "Method of Carrying Out Melting Process described and claimed therein . . ." (PX-2A, p. 13).

In a "New Oath and Affidavit Under Rule 45(c) and filed May 15, 1956 it is stated:

> "We, Theodor E. Suess, Herbert Trenkler, Hubert [81] Hauttmann and Rudolph Rinesch, all Austrian nationals . . . being duly sworn, depose and say:
>
> "That during 1949 and 1950 while employed by Vereinigte Oesterreichische Eisen-Und Stahlwerke Aktiengesellschaft at Linz, Austria, we were engaged in the development of methods and apparatus for the production of steel. During the course of such employment, we jointly developed a process for the refining of iron to steel with the use of high purity oxygen . . .

> ". . . and deponents say that they verily believe that they are the original, first and joint inventors of the invention or discovery in "Method of Carrying Out Melting Process," described and claimed in application Serial No. 206,147, filed January 16, 1951, and that they do not know and do not believe that the invention was ever known or used before their invention or discovery thereof . . . (PX-2B, pp. 78-85).

In conjunction with the continuation-in-part application filed November 16, 1955, the following oath, power of attorney, and petition is annexed:

> "Being duly sworn, I, Theodore Eduard Suess, depose and say that I am a citizen of the Republic of Austria, residing at 45 Scheibenpogenstrasse, Linz—Spallerhof, Austria, that I have read the foregoing specification and claims, and I verily believe I am the original, first and sole inventor of the invention or discovery in Method of Carrying Out Melting Processes described and claimed therein . . ." (PX-2A, pp. 38-39).

[82] In addition, on May 15, 1956, the patentees filed a "New Oath and Affidavit under Rule 45(c)" which is substantially identical to the May 15 oath filed with the original application. (PX-2A, pp. 50-57).

The second oaths filed on May 15, 1956 with both the original and the continuation-in-part application resulted from protracted litigation in which it was ultimately determined that the process was the result of joint inventorship. (PX2A, p. 52; PX2B, p. 80).

Thus, it is a matter of record that all four patentees executed oaths substantially in the form required by Section 115. *Carter-Wallace, Inc.* v. *Davis-Edwards Pharmacal Corp.*, 341 F.Supp. 1303 (E.D.N.Y. 1972). Because the changes which followed the original applications were changes in form and not in substance, and did not constitute new matters, additional oaths were not required. *Aerosol Research Co.* v. *Scovill Mfg. Co., supra.*

H. Enforceability of the Patent

The defendant alleges that the patent is unenforceable because of alleged frauds perpetrated on the Patent Office, alleged misuse of the patent after its issuance and because of an alleged attempt to prevent relevant evidence from becoming **[83]** before the Court. Because much of this had already been discussed, it will be treated in summary form.

1. Fraud perpetrated on the Patent Office

The defendant premises its assertion of fraud on the failure of the plaintiffs to present the Durrer-Hellbruegge work to the Patent Office. As has been thoroughly discussed, the prior work of Durrer-Hellbruegge does not show that the plaintiffs derived their knowledge from the experiments at Gerlafingen. Durrer equated his work with the work of Schwarz and Miles which was clearly considered by the Patent Office. Thus, even if the patentees should have called the attention to the Patent Office to the work of Durrer and Hellbruegge, any failure to do so was inconsequential.

As to defendant's argument that the patentees misrepresented to the Patent Office that the Schwarz process was inoperable, there is no validity. The record convincingly supports the conclusion that the Schwarz process was inoperable. Furthermore, the record clearly shows that the Schwarz process was called to the attention of the Patent Office.

[84] As to any objection of the patentees to emphasize the importance of the Cuscoleca patent in the Patent Office, the record is clear that the latter office was fully aware of the Cuscoleca patent and that the Suess and Cuscoleca patents are addressed to different inventions.

The defendant further alleges that the patentees perpetrated a fraud on the patent office when they alleged that the earlier foreign application was Austrian Appli-

cation Serial No. A 480-50 filed on January 31, 1950. It now appears that an earlier Suess application, Swiss patent No. 283,825 (DX-23A) was filed four days earlier on January 27, 1950.

I take judicial notice of the fact that January 27, 1950, was on a Friday, and January 31, 1950 was on a Tuesday. Thus, the Austrian application was filed only two business days after the Swiss application. Defendant has failed to demonstrate any sinister intentions on the part of the patentees in making this erroneous statement.

[85] It is provided in 35 U.S.C. § 102(d) that an applicant shall be entitled to a patent unless:

> "(d) the invention was first patented or caused to be patened by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country or an application filed more than twelve months before the filing of the application in the United States."

It should be observed that the Swiss application was filed on January 27, 1950, less than twelve months prior to the application here, and the Swiss patent issued October 16, 1952, a year and a half after the Suess application was filed here (DX-23A).

As counsel for the plaintiffs conceded, at worst the patentees would be deprived of the advantages of the earlier European filing date under Section 119.

Defendant also challenges the credibility of the Rinesch and Hauttmann affidavits. This argument is unsupported by the record and without merit. Furthermore, misrepresentations are not material unless they relate to the condition of patentability. *Trio Process Corporation* v. *L. Goldstein & Sons, Inc., supra.*

[86] It therefore appears that defendant's allegations of fraud are without merit.

2. Alleged Misuse of the Patent After Its Issuance

Defendant alleges that the plaintiffs misused the Suess and Cuscoleca patents in initiating lawsuits. Once the Suess patent was issued, Cuscoleca was withdrawn as the basis of the *McLouth* litigation, and it would appear that all subsequent litigation relied on Suess.

As to the allegations that the plaintiffs made false statements concerning the Suess process, and that by withholding information improperly coerced licensing agreements, there are no supports in the record.

While several other minimal allegations are made, they are likewise unsupported by the record and without merit.

3. Attempts To Prevent Relevant Evidence from Coming Before the Court

Defendant alleges that the plaintiffs attempted to prevent vital information from coming before the Court, by attempting to prevent Dr. Durrer from being subpoenaed. When Dr. Durrer was served with a subpoena, he appeared before the Honorable Wallace S. Gourley of this Court in an effort to have **[87]** that subpoena quashed (DX-269). Judge Gourley quashed the subpoena and Dr. Durrer voluntarily appeared at the McLouth trial. The charge of attempting to withhold this critical testimony, likewise, is not supported by the record.

From all of the foregoing, I conclude as a matter of law that the Suess et al. Patent No. 2,800,631 is valid.

1. *Antitrust Defenses.*

The defendant, J & L, contends that through their agreements and actions the plaintiffs have conspired to violate Sections 1 and 2 of the Sherman Antitrust Act, 15 U.S.C. In its Consolidated and Amended Answers and Counterclaims, the defendant argues that during or prior to May

1952, VOEST, BOT OAMG and Kaiser conspired to create an unlawful monopoly, patent pool, and cartel to exact unlawful tribute in interstate commerce for all top blown methods of steel refining and equipment used therein; that improvements made to the refining process by VOEST and OAMG were at best narrow improvements over Durrer, Hellbruegge, Schwarz and Miles; that the four conspirators created the patent pool to gain rewards greater than their individual patents would justify and to exact tribute on all steel manufactured by the top blowing oxygen method; that the conspirators published the fact **[88]** that "the most important group of patents . . ." had been acquired ". . . so that it can be avoided, that one single patent holder is played off against another . . ."; that they had further published that BOT had created a "large patent pool" including patents of Schwarz, Miles and VOEST, and that VOEST had acquired shares of the BOT joint-stock company; that during or prior to May, 1954, the conspirators entered into an agreement with Mannesmann, granting it a license under the Schwarz patent in return for licensing rights for BOT under Mannesmann's present and future knowhow and patents and a pledge that Mannesmann would not contemplate or operate a steel plant in the United States; that the conspirators, in furtherance of their plan, have entered into numerous agreements with patent holders worldwide so as to stifle competition and concentrate their control; that in furtherance of their conspiracy the conspirators perpetrated a series of frauds on the United States Patent Office, thereby procuring patents (including the patent in suit); and that the conspiracy has not been abandoned nor terminated, but continues to exist in restraint of trade in **[89]** interstate commerce.

Upon analysis of the charges and the record, I conclude that there is no basis for the defendant's contentions.

Concisely stated, the defendant argues that by gaining the rights to many BOF patents (Suess, Walker, Cuscole-

ca), the plaintiffs had the power to control the price of steel made by BOF methods; that their agreement with Kaiser shows the purpose of the parties to gain control of the industry in the United States; that they forced potential users of BOF systems to enter into royalty agreements by litigation, or threats thereof, based upon infringement of one or the other patent; and that they thus stifled natural competition between patent owners and gained greater rewards than would naturally flow from the Constitutional guarantee of patent monopoly.

In searching the record I find that there was very little testimony or evidence directed to the antitrust allegations. Nonetheless, I have studied the entire transcript to ascertain whether the charges are substantiated. They are not.

[90] It is apparent that the plaintiffs did gain the rights to a package of patents which dealt with the refining of steel through top blowing of pure oxygen. Cross licensing or exchange of patents, however, is not per se illegal. *McCullough Tool Co.* v. *Well Surveys, Inc.*, 395 F.2d 230 (1968), *cert. den.* 393 U.S. 925 (1968); *Cole* v. *Hughes Tool Co.*, 215 F.2d 924, 935, C.A. 10, 19—. Thus I must determine whether the arrangement in this case so dominated the relevant market or could do so as to be violative of antitrust provisions.

The "relevant market" has been defined as "the part of trade or commerce which is monopolized or attempted to be monopolized," *United States* v. *DuPont & Co.*, 351 U.S. 377, 394, ff (1956). Numerous cases have held, however, that when two or more processes can be used to produce identical or interchangeable products, and these have been bought in the market on such a basis, the relevant market encompasses the totality of the materials produced by these various methods. *United States* v. *Aluminum Co. of America*, 148 F.2d 416, 424-425, C.A. 2, 1945.

[91] In the case at bar, as has been thoroughly documented above, the Suess and other BOF processes constituted only a few of the methods by which steel was being produced commercially. At the time of Suess' introduction on the market, the open hearth, electric and Bessemer methods were all found in use. Admittedly the BOF gained immediate acceptance throughout much of the industry because of its low cost, high efficiency, and quality of product. But these factors certainly are not a basis upon which antitrust violations may be determined. *U.S.* v. *Aluminum Co. of America,* 44 F.Supp. 97 (D.C.N.Y.) rev. other grounds 148 F.2d 416, C.A. 2, 1945.

The Supreme Court has held that the interchange of patent rights ". . . is frequently necessary if technical advancement is not to be blocked by threatened litigation." *Standard Oil Co.* v. *United States,* 283 U.S. 163, 171 (1931). The case at bar is exemplary. The Suess, Cuscoleca and other patents contain obvious similarities which could presumably form a basis for continuous infringement litigation. Indeed, the publications of plaintiffs, which defendants cite as proof of the conspiratorial intent, tend instead to show an attempt at self protection. To impute a more sinister motive in this case would require a predispositive inclination toward guilt which I cannot assume.

[92] Even if the royalties charged by the plaintiffs are considered onerous (a question which I will not entertain here), such an allegation standing alone is without legal significance. "Unless the industry is dominated, or interstate commerce directly restrained, the Sherman Act does not require cross licensing patentees to license at reasonable rates others engaged in interstate commerce." *Standard Oil Co.* v. *United States, supra,* at page 172.

Defendant's reliance upon BOT's agreement with Kaiser as proof of the intent to create a monopoly is without merit. Study of the record does disclose extremely broad definitions of "Oxygen Metal Process," "Patent Rights," and "Converter."

> "(A). Patent Rights" shall mean all process, equipment designs for equipment, products, compositions of matter, formulae, technical information and know-how relating to or in any way connected with the Oxygen Metal Process, as hereinafter defined, including all inventions, ideas or discoveries in connection therewith disclosed or claimed in any United States patent applications and/or **[93]** United States patents, all as more particularly described in Exhibit "A" attached hereto and by this reference incorporated herein and made a part hereof.
>
> (B) "Oxygen Metal Process" shall mean a process for the production of metal products as the result of treatment of molten metal with oxygen in a converter as herein defined and comprising but not limited to the oxygen process for the manufacture of steel as practiced at Linz and Donawitz, Austria, but not limited to the production of ferrous metal products.
>
> (C) "Converter" shall mean the reaction vessel in which the Oxygen Metal Process is conducted, including the oxygen injection or applying apparatus appurtenant thereto." (PX-7)

Despite the apparent vagueness, however, the inclusion of "Exhibit A," a list of patents and applications claimed by plaintiffs, serves to delineate the processes which are covered. As with the formulation of patent language itself, the writers of agreements such as this generally strive for broadness, thus **[94]** staking out the greatest possible area of coverage. Such goals, however, are not automatically an indication of antitrust inclinations. Certainly the agreement does not cover the open hearth or Bessemer processes, both of which can use pure oxygen, although they could presumably fit within the definitions. Thus from the rec-

ord I can imply nothing more than that the plaintiffs were attempting to regulate all aspects of the patented processes which were theirs by law, granted to them by our Constitution.

[95] Breach of Contract and Patent Infringement

Having reached the conclusion that the patent in suit is valid, I must now direct my attention to two questions, the first of which is whether or not by virtue of its operations at Aliquippa, the defendant has breached its contract with Kaiser (PX-7A). The second question is whether or not by virtue of the operation of two basic oxygen steel-making converters at its Cleveland Plant, the defendant has infringed Suess et al. patent No. 2,800,631 (PX-1).

On February 4, 1956, Kaiser and J & L entered into a licensing agreement whereby Kaiser granted to J & L a non-exclusive license under certain specified patent rights to produce and sell steel from molten ferrous metal utilizing the equipment and methods of the L-D process at converters to be constructed at Aliquippa. Among the patents covered in the license agreement was application Serial No. 547,233, filed November 16, 1955, on which Suess et al. patent No. 2,800,631 issued. Pursuant to the license agreement, J & L covenanted to pay Kaiser royalties in accordance with an established schedule (PX-7A, Exhibit B). That schedule provides that J & L would pay Kaiser a total royalty of $709,750 of which $285,000 was to be paid "upon commencement of operation" of J & L's first **[96]** converter at Aliquippa. In addition, J & L agreed to pay $42,375 "annually thereafter for ten (10) consecutive years payable on each anniversary date of such commencement of operations." Unpaid balances were to bear interest at the rate of 4% per year "payable at the time of each annual installment payment." It was provided in the license agreement that notwithstanding any other provisions of the agreement, the obligation to tender the ten annual royalty payments would not accrue, until J & L engaged in the commercial practice of the oxygen steelmaking process or commercial operation of the converter "within the scope of the valid claim of an unexpired United States patent issuing on any of the Patent Rights." Initially upon commencement of operations, J & L refused to make the $285,000 payment. However, this payment was finally made, but no additional royalty payments were ever forthcoming (PX-472, pp. 1203-04). For this reason, Civil Action No. 61-551 was filed by Kaiser against J & L to compel contractual payments.[23]

At its Cleveland plant, J & L added two additional converters without license from Kaiser. As the evidence shows and as J & L has admitted, the same process is practiced in the **[97]** converters at Cleveland as in the converters at Aliquippa (PX-84, p. 15). Because of the unlicensed operation of the Cleveland converters, Kaiser and the other plaintiffs filed Civil Action No. 62-272 to recover damages and enjoin further alleged unlawful infringement by J & L.

Thus, the issues presented which must be resolved require determinations of whether or not the operation of J & L at its Aliquippa Plant falls "within the scope of a valid claim of an unexpired United States patent issuing upon any of the Patent Rights." The other principal issue for determination is whether or not by virtue of the operation of the converters at its Cleveland Mill, J & L is operating within the scope of claims 1 or 2 of the patent in suit. That is, whether or not by virtue of its operations at Cleveland, J & L has infringed Patent No. 2,800,631.

The plaintiff in the contract action alleges that the defendant is foreclosed from attacking the validity of the patent under the terms of the license agreement and under existing law. It is provided in the license agreement

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[23] It should be observed that in the contract action, the only plaintiff is Kaiser Industries Corporation.

(PX-7A, Art. G) that "LICENSEE SHALL NOT AT ANY TIME DURING THE TERM OF THIS AGREEMENT DIRECTLY OR INDIRECTLY CONTEST OR DENY THE VALIDITY THEREOF OR THE RIGHT AND TITLE OF LICENSOR THEREIN." **[98]** *In Automatic Radio Manufacturing Co., Inc.* v. *Hazeltine Research, Inc.,* 339 U.S. 827, 836 (1950) it was stated:

> "The general rule is that the licensee under a patent license agreement may not challenge the validity of the licensed patent in suit for royalties due under the contract. *United States* v. *Harvey Steel Co.,* 196 U.S. 310."

However, in 1969 the Supreme Court changed this general rule. *Lear, Inc.* v. *Adkins,* 395 U.S. 653 (1969). And thus the plaintiffs' allegation that the defendant is foreclosed from attacking the validity of the patent is without merit. By way of defense J & L alleges that because the patent was secured in violation of the antitrust laws, the plaintiff is guilty of unclean hands, and that therefore this covenant is unenforceable. In support of this position the defendant relies on several cases which are totally inapplicable here.[24] The basis for determining that these cases are inapplicable arises from the fact that in those cases the license agreements involved price fixing provision which were *per se* antitrust violations. As the Court in *Automatic Radio Manufacturing Co., Inc.* v. *Hazeltine Research, Inc., supra,* stated at page 836:

> "The general principle of the invalidity of price fixing agreements may be invoked by the licensee of what purport to be valid patents to show in a suit for royalties that the patents are invalid. . . . There is no showing that the licensing agreement here or the practices under it were a misuse of patents or contrary to public policy. . . . The general rule applies, and petitioner may not, in this suit, challenge the validity of the licensed patents."

[24] The cases the deefndant relies upon are *MacGregor* v. *Westinghouse Electric & Manufacturing Co.,* 329 U.S. 402 (1947); *Katzinger Co.* v. *Chicago Metallic Manufacturing Co.,* 329 U.S. 394 (1947); *Sola Electric Co.* v. *Jefferson Electric Co.,* 317 U.S. 173 (1942).

[99] As has been discussed previously under the issue of patent validity, the defendant has failed to demonstrate and the record does not support a determination that the plaintiffs violated the antitrust laws. For this reason, the estoppel raised by the defendant is clearly inapplicable.

The question thus becomes one of determining whether or not J & L at its operations at Aliquippa and at Cleveland falls within the scope of the claims of the Suess et al. patent. That is, is the operation at Aliquippa "within the scope of a valid claim of an unexpired United States Patent issuing upon any of the Patent Rights" or, is the operation at Cleveland within the scope of Claim 1 or Claim 2 of the patent in suit? Defendant has admitted that there is no significant difference between its operation at Aliquippa and those at Cleveland (PX-484, p. 15). For this reason, and in the interest of conserving time and avoiding repetition one analysis of the J & L operations at Aliquippa and Cleveland will be made in an effort to determine whether or not they infringe upon the claims of the Suess et al. patent.

In order to install the new furnaces at its Aliquippa Plant, J & L obtained the services of Kaiser. To Kaiser fell the job of engineering and construction, and the training of J & L operating personel (R. 3221-26). Before commencement of operations at Aliquippa, Mr. Edwards the original operating **[100]** superintendent of the Aliquippa L-D Plant went to both Linz, Austria, and Donawitz, Austria, to study actual operations of an L-D plant (R. 3224-25; PX-469, pp. 9-10). Edwards and W. D. Smith, the original general foreman at Aliquippa, visited the Dofasco plant at Hamilton, Ontario which was operated under license from BOT and two turn foremen and two melters from Aliquippa were sent to Dofasco for at least one week

to observe "and to get familiar with the operations." (PX-469, pp. 10-11). Mr. Prince who helped prepare an operating manual spent four months in Linz and Donawitz, Austria, studying all phases of the operation of the process (R. 3226). Immediately upon returning from Austria, Prince went to Aliquippa to assist in the completion of the plant and in the initial operations of the plant (R. 3221). Together with others, Prince gave classroom and in-plant instruction to the J & L operating personnel (R. 3222-23; PX-469, p. 13). In addition, Kaiser made arrangements for three Austrians with lengthy experience operating the L-D process to be present at Aliquippa before and during the initial operations of the plant (R. 3223; PX-469, pp. 14-16).

The Aliquippa Plant commenced operation November 11, 1957 (R. 3222; PX-469, p. 6). From that time through the spring of 1958, Kaiser personnel maintained close contact with the Aliquippa operations (R. 3222; 3954-54; 3996-97; 4005-06; PX-469, p. 38; DX-203, p. 326).
[101]

The Defendant Does Not Use the Deep Penetration of the Schwarz-Miles Prior Art

The main defense by J & L was that it was practicing the deep penetration in accordance with the teachings of Schwarz. The plaintiff, however, produced witnesses to show that J & L was not practicing the deep penetration as advocated by Schwarz.

[102] When Mr. Prince visited Aliquippa on the occasion of the plaintiffs' inspection in February, 1966, he compared the operations after start-up with the then existing operation and stated (R. 3477):

> "The operation at Aliquippa after the start-up and in the early days when I spent so much time there were essentially the same as being conducted now . . .

> The L-D process was being carried out at Cleveland during the inspection and at Aliquippa during the 1966 inspection, and this same process was the one which was started in Aliquippa in . . . November of 1957."

To a large extent the testimony of Mr. Prince is very similar to that of the other experts called in this trial. When asked what the patent teaches him as one skilled in the art as to the principles of the process described therein, Mr. Prince replied:

> "It teaches me how to refine molten impure iron in the presence of a slag and in a refractory lined vessel by means of blowing with oxygen.
>
> It tells me that the stream of oxygen must be directed vertically downwardly at substantially the center of the bath so that it goes through the slag and engages with the metal of the bath.
>
> By doing this, part of the reactions take place with part of the iron of the bath and with the impurities in the molten charge, and this takes place without deep penetration and in the high temperature localized reaction zone, which is spaced away from the sidewalls and the bottom and in the upper regions of the bath.
>
> In achieving this localized reaction zone, a circulation of the liquid bath is induced and those parts of the molten charge which are away **[103]** from this localized reaction zone are brought to it and oxygen reacts with them in this high temperature reaction zone; this all taking place in a central position in the upper regions of the bath whereby there is minimum damage to the refractory lining at the walls or at the bottom." (R. 3478).

When asked whether or not the teachings of the patent were actually employed by J & L at its basic oxygen plant at Aliquippa and Cleveland, Mr. Prince answered in the affirmative (R. 3481). Dr. Chipman's testimony was substantially identical (R. 532-33; 570-72).

Mr. Prince also testified that the avoidance of material agitation in the bath by the oxygen stream meant "avoidance of deep penetration with the attendance of some agitation from the oxygen stream." (R. 3610)

Both Dr. Chipman (R. 563-64; 571) and Mr. Prince (R. 3266-67; 3472-77, 3478, 3481) testified that J & L avoids deep penetration in its regular operations at Cleveland and Aliquippa. In February 1966, Mr. Prince attended an inspection of the J & L works at Aliquippa and Cleveland (R. 3450, 3454, 3472). PX-328 is a summary of the observations made at Aliquippa, and PX-329 is a summary tabulation of data taken during the Cleveland inspection (R. 3450-51, 3454-59). Specifically Mr. Prince stated (R. 3472-74):

> "My conclusion of viewing the operations and the work that I have been discussing is that there is no deep penetration of the bath; that the indent which develops is of the order as shown in PX-328 and PX-329, that the localized reaction zone is in the upper regions of the bath;
>
> [104] That blowing is conducted not to penetrate deeply and damage the bottom, and so have difficulty in phosphorus removal; nor is it done to blow on the surface and cause an excessive slopping condition, but so that the localized reaction zone is developed in the upper regions of the bath which is spaced from the sidewalls and bottom so that injury to the refractory lining is avoided, and so that a circulatory movement is induced, by which those parts of the liquid bath away from this high-temperature localized zone are brought to it and undergo reactions with the oxygen of the jet, and all in such a way that there is minimum injury to the refractory lining;
>
> In every case in J & L's Aliquippa Plant and their other LD plants, the oxygen is blown by a vertically-held lance, and the oxygen is directed downward onto the bath vertically, and always in the presence of the slag, so that the oxygen goes through the slag and reacts with the metal.

> Q. . . . In your opinion, is the operation conducted at Cleveland and the operation at Aliquippa conducted so as to provide an appropriate slag which will enable the removal of phosphorus to low levels?
>
> A. Yes. The operation of the lance and the oxygen flow is such as to give an early formation of fluid slag."

Dr. Chipman in his testimony stated that at Aliquippa and Cleveland (R. 821), "the result of the blow was a good low-phosphorus steel, and this tells me again that the blowing was not deep, that it was satisfactory."

In order to demonstratively show that deep penetration is avoided by J & L, the plaintiffs presented three demonstrations.

[105]

The Demonstrations and Tests—Avoidance of Deep Penetration

The first demonstration was designed to show that the operational process conducted at Aliquippa and Cleveland avoids deep penetration. The second demonstration was designed to show that the depth of penetration could be determined from the jet characteristics, and Dr. Kemper indicated that the penetration actually obtained was not deep especially in comparison to the total bath depth. The third demonstration consisted of a series of penetration depth studies.

As has been thoroughly discussed previously, one of the major operational characteristics of the Suess process is that it avoids undue wear on the refractory. Dr. Chipman stated that in reviewing the J & L operations, (R. 821):

> "Basically, I found no undue erosive effects on the furnace bottom. That is, inspecting the bottom when the vessel is turned down for pouring, one can see the part of the bottom which was immediately under the lance during the blowing, and there was no inordinate amount of refractory wear that was visible at this point."

Mr. Prince testified that he made observations at both Aliquippa and Cleveland in February in 1968. Specifically, Mr. Prince stated (R. 3476):

> "... I was particularly looking to see if there was any localized wear in a position equivalent to the vertical lance axis, and there was none of a character which would suggest to me that deep blowing was being done ..."

Mr. W. D. Smith of J & L likewise indicated that the bottom wear rate was comparatively low (PX-479, pp. 123-24).

[106] A second operational characteristic which can be observed and which shows that J & L does not employ a deeply penetrating jet is the control of the composition of the metal bath and the slag which J & L achieves. Dr. Chipman stated (R. 821):

> "The other criterion that I used is with regard to phosphorus. There was apparently no difficulty in meeting a good phosphorus specification in the metal. The result of the blow was a good low-phosphorus steel, and this tells me again that the blowing was not deep, that it was satisfactory."

This testimony of Dr. Chipman's was in relation to both the Aliquippa and Cleveland works. Mr. Smith testified that the phosphorus at the end of the blow is normally around .013% and that on medium and high carbon grades it is about .018 to .20% (PX-469, pp. 162-68). At an inspection conducted by the plaintiffs at the Aliquippa works, the average phosphorus content of the finished steel was found to be 0.0135% (PX-404). This low phosphorus content in the finished steel product is highly indicative of the fact that the defendant's operations avoid deep penetration.[25]

[25] As has been thoroughly discussed, *supra*, in order to insure adequate phosphorus removal, it is necessary to secure an early fluid slag. The slag in turn is secured by the creation of a localized reaction zone which avoids deep penetration.

A number of tests were conducted in order to demonstrate **[107]** that J & L's operations avoid deep penetration of the jet into the metal bath. PX-455 demonstrates the result of utilizing the single hole nozzle and reveals that the depth of penetration is approximately five inches in a bath of 37 inches, or only 13% of the bath's depth. The same chart also shows that with the two-hole nozzle in regular operation, the depth of penetration is only four inches in a bath of 37 inches depth, or approximately 11% of the bath's depth. Dr. Kemper conducted a series of tests concerning depth of penetration and impingement. His testimony concerning these tests appears at R. 1924-2569.

Dr. Kemper testified that, "the properties of the jet at the surface which will determine the depth of indent are the density and the velocity of the jet as it approaches the surface." (R. 1925). However, Dr. Kemper went on to explain that "the depth of the indent ... is equal to that dynamic pressure divided by the weight density of the liquid." (R. 1962)[26]

In order to demonstrate depth of penetration, Dr. Kemper and others conducted a variety of tests.

The electric probe tests (PX-38B) were conducted at Linz late in 1966 and were described in detail by Mr. Wallner (R. 1280-1306), Mr. Oberhauser (R. 1608-17) and Mr. Truppe (R. 1757-60). During these tests, an electric probe was **[108]** attached directly below the bottom of the lance, and immersed in the bath at depths varying from 20-200 mm. An electric current passing through the probe was interrupted when the probe became exposed, i.e., when the probe was above the bottom of the indent. With a constant

[26] Dynamic or impact pressure is the difference between the stagnation pressure and the static pressure, i.e., that pressure due to the motion of the fluid (R. 1961-62; PX-429).

lance height of 700 mm., and at a pressure of 12 atmospheres the depth of penetration of the oxygen jet was approximately 50 mm. (PX-38B). That the probe itself does not reduce the depth of indent was verified by Dr. Kemper (PX-145). Based on Dr. Kemper's calculation, it was determined that with a lance height of 700 mm. at 12 atmospheres, the depth of penetration was about 90 mm. (PX-446).

Another series of tests, the Linz comb tests were carried out in 1950 using a 50 ton ladle, and following the Suess teachings in order to obtain information regarding depth of penetration in a vessel more comparable to that employed in commercial operations. In these tests steel rods with projecting teeth were immersed at varying depths in the molten metal bath. The comb was pulled horizontally across the axis of the oxygen jet during the course of a blow. The comb was then removed and observed to determine whether or not any teeth had been destroyed.

Nine comb tests were conducted in October 1960 (PX-31A and B). Similar tests were conducted in May and September 1960 (PX-32-1, Annexes 15-17; PX-32-97A; PX-34B). Dr. Hauttmann explained that these tests "were intended to find out what goes on in the bath at different distances from the bath surface, "and that the demonstration was to be made by observing the **[109]** condition of the combs after the tests (PX-424, pp. 2193-94). The tests were conducted with a 1.375 inch nozzle at a height of 1050 mm. (about 42 inches) at a pressure of about 100 psig. (7 atmospheres).

The results of these tests show that of those teeth which were 0 to 125 mm. below the bath surface, 50 percent were removed; of those teeth which were between 125 and 250 mm. below the bath surface, 33% of the teeth were removed; and of those teeth at a distance greater than 250 mm. below the bath surface, none was removed. Based on these tests, Dr. Hauttmann concluded that the oxygen jet

does not penetrate beyond 230 mm. (about 9 inches) (PX-424, pp. 2205-07). The Linz tests thus established that in practicing the Suess process, the oxygen jet does not penetrate deeply.

Dr. Kemper made extensive tests on models of the J & L nozzles in order to determine the depth of penetration at J & L (R. 2444-50; PX-44). From his tests, Dr. Kemper was able to conclude that the depth of penetration at defendant's Aliquippa operations, employing a single-hole nozzle at a height of 80 inches and a flow rate of 6,500 CFM is approximately 5 inches, and that for the two-hole nozzle at 60 inches and 6,500 CFM, the depth of penetration was a little over four inches **[110]** (R. 2475-77; PX-449; PX-450; PX-451).

Dr. Kemper further explained that the presence of slag would reduce the depth of penetration to approximately one-half that shown in PX-449, PX-450 and PX-451 (R. 2483-89).

Mr. Prince also made tabulations from the operations at Aliquippa (PX-328). He observed that the depth of penetration during each blow varied between 5 and 6 inches. (R. 3451).

The defendant contends that it was practicing the teachings of Miles at its plants at Aliquippa and Cleveland. In support of this contention defendant conducted a series of tests at Charleston, South Carolina in December 1966 to demonstrate the operativeness and practicality of the prior art which J & L alleges it practices. While four tests were made, the defendant only relies on tests 3 and 4 and the relevant exhibits, DX-212 and DX-213.

Dr. George Cunnigham Smith, a research associate at J & L conducted these tests (R. 4218). The results of his tests appear in DX-169. Dr. Smith stated that heat number 3 was conducted according to the teachings of Miles (R. 4228-32, 4271-72) and that heat number 4 was conducted

according to the teachings of the Rinesch affidavit (R. 4238-40; DX-188). From the steel produced in these tests, pencil ferrules were made (R. 4262; DX-171, DX-172, DX-189).

[111] While the witness originally testified that an attempt was made to follow the instructions of Miles, on cross-examination Dr. Smith admitted that Miles' teachings could not be used in small furnaces. Furthermore, the witness indicated that the Miles' teachings would be impractical at the Aliquippa and Cleveland works because the heat would be long and drawn out and the rate of oxygen supply would be small compared to the hot metal charge. The present blowing time at Cleveland is 20-25 minutes whereas if Miles were practiced the blow would require 100 times longer, and would be commercially intolerable (R.4393). The remainder of the cross-examination is convincing of the fact that the teachings of Miles were not adhered to at Charleston (R.4394-4452).

Test number 4 purported to follow the explanation contained in the Rinesch affidavit which attempted to explain the June 17, 1949 Linz tests. The defendant alleges that good steel was produced during this test while the Rinesch affidavit alleges that the June 17 tests resulted in failure.

It is imperative to recognize while examining DX-212 and DX-213, that absolute depth of penetration is a meaningless term. As Dr. Smith admitted, depth of penetration can only be meaningful in relationship to total bath depth (R.4477-4484). Furthermore, as counsel for the plaintiffs stated at final argument (FA pp. 218-19):

> **[112]** "The Miles bath depth, of course has to be calculated from the percent penetration and penetration figures which are set forth in that table. But you find that Miles at 6.9 inches is 43 percent of the bath depth. The patentees in their following of Miles had 43 percent, but the Suess et al. patent teaches only 33 percent penetration. When absolute penetration is considered without taking into account whether the bath is 10 inches or 50 inches in depth, one can conclude that the penetration in Suess et al. is greater than that taught by Miles. But the comparison is obviously improper. And when the penetration is placed in proper context, it is clear that Miles penetration is substantially greater than that taught by Suess et al. Actually, the penetration of Miles is one third greater than the penetration taught by Suess."

Plaintiffs' counsel further clarified this matter (FA p. 219):

> ". . . It is clearly shown in DX-212 . . . that those penetrations at Aliquippa are on the order of ten to 13 percent of the bath depth. That shows penetrations, penetrations that are given there, as 6.6½ inches up to 8 and 9 inches for Cleveland representing only approximately 9 to 13 percent of the bath depth, whereas Miles is 6.9 inches and is 43 percent of the bath depth . . . 9 percent is a far cry from 43 percent . . . and at Aliquippa they penetrate to about 10 percent of the bath depth as contrasted with our assumed Miles penetration which is about 43 percent."

This explanation may be illustrated as follows:

Operation	Bath Depth	Penetration	% Penetration
Miles	16 inches	6.9 inches	43%
The Patentees following Miles	19.6 inches	8.2 inches	43%
Suess et al Patent	39.4 inches	12.5-13.0 inches	33%
Aliquippa Single Hole Nozzle	38 inches	5.0 inches	13%
Aliquippa Two Hole Nozzle	38 inches	4.0 inches	10.5%
Cleveland M16C Nozzle	68 inches	8.0 inches	12%
Cleveland M18C Nozzle	78 inches	9.0 inches	13%

(R.4481-85).

[113] While counsel for the defendant argued that the steel produced at Charleston was utilized to manufacture pencil ferrules, nothing in the record indicates that this steel was comparable in quality to open hearth steel, nor has there been a showing by J & L that the steel produced at Charleston was suitable for anything more than this limited purpose.

Additionally, the parameters used by Dr. Smith were limited to lance height, nozzle size, and blowing pressure. As has been expounded elsewhere, the Suess process was far more detailed. Consequently, I conclude that the Charleston tests do not prove the operativeness or the practicability of the prior art, or that J & L was following the teachings of Miles. Furthermore, because the operations at Aliquippa do not penetrate below 13% of the bath depth, and most probably the average penetration is in the range of 6 to 7 percent, the conclusion thus is inescapable that at its Aliquippa operations, J & L does not penetrate deeply.

In reviewing the operations of J & L at its Cleveland works, Dr. Kemper prepared two charts (PX-450 and 451; R.2478), which demonstrated that using its 3-hole nozzle at 13,500 CFM and at a lance height of 50 inches, J & L produces an indent of 6 inches. Furthermore, when J & L employs the same type nozzle at a pressure of 17,500 CFM, an indent of 8 inches is produced (R.2480). Using a single-hole nozzle operating at a height of **[114]** 80 inches with a pressure of 73 pounds per square inch gauge, J & L produces a penetration of between 9 and 10 inches (R.2480).

Dr. Kemper testified that by employing the graph shown in PX-450 one would be able to accurately predict the depth of penetration of J & L's operation at Cleveland (R.2481). However, he added that all these figures ignored the presence of slag so as to parallel the Linz electric probe tests (R.2483). Accordingly, we also determine that at its Cleveland operations, J & L does not penetrate deeply.

Tests and Demonstrations—Localized Reaction Zone

Considerable testimony was presented concerning the localized reaction zone which the Suess patent teaches. After presenting testimony concerning the execution of a localized reaction zone in the Suess process (R.269-285), Dr. Chipman discussed the operations of J & L:

> "Now, Doctor, you spoke earlier about the hot spot or localized reaction zone. I wish you would tell us specifically whether in your belief, in the J & L operations which you have observed at Aliquippa and at Cleveland there is this localized reaction zone or hot spot.
>
> A. Yes, I believe there is a reaction zone or highly heated region in the area where the jet comes into contact and engages the metal.
>
> Q. And that, as you have indicated, would be spaced from the refractories; namely, the side-walls and the bottom wall?
>
> **[115]** A. Yes. In all cases that I have observed, the jet is positioned centrally and the hot region, therefore, is developed at a distance from the refractory walls so as to inflict the least damage upon the refractories." (R.290-91).

When asked whether the oxygen-iron contact occurs in J & L's operation in a localized reaction zone, Dr. Chipman again answered affirmatively (R.571-72).

Mr. Prince also testified that at its Aliquippa and Cleveland works J & L had the "formation of a localized reaction zone spaced from the refractory walls of the vessel somewhere in the upper regions of the bath" (R.3265). He continued (R.3265-66):

> "The progress of the heat was such that the unrefined portions of the bath were brought to the central localized reaction zone, which was at a very high temperature, and refined. And, the localized reaction zone was such that there was no damage—excessive damages—to the bottom. And it was spaced from the walls so that

there was no excessive damage to the walls; just the normal wear of the vessel." (R.3265-66).

Dr. Elliott reviewed the Linz thermocouple tests which were designed to demonstrate the existence of a localized reaction zone. He explained (PX-504, p. 6259):

> "One of the thermocouples was located essentially directly under the area of impingement of the oxygen jet on the bath. The thermocouple indicated a very rapid rise in temperature, and it was quickly destroyed. This indicates the existence of this hot reaction region.
>
> [116] The other thermocouples located further away [from the nozzle] were not destroyed. Their temperatures did not rise rapidly."

In the thermocouple tests four thermocouples were located near the axis of the lance (R.1190-94; PX-32-1, Annex 19; PX-170). The temperature of the thermocouple nearest the lance axis rose rapidly and destroyed the instrument (R.1211-13, 1215-18). The other thermocouples experienced more gradual heat rises (R.1211-15). This test enabled Mr. Wallner to conclude that the localized reaction zone exists below the oxygen jet as it impinges on the bath (R. 1218-19). Dr. Hauttmann drew the same conclusion from the tests. (PX-424, p. 2176).

Further proof of the existence of a localized reaction zone was gained from the work of Messrs. Wallner, Oberhauser and Truppe conducted at Linz in December 1966. Their work included utilizing a silicon "solar" cell radiation pyrometer built into the lance so that temperature measurements could be taken directly below the lance where the oxygen impinges on the bath. A thermocouple was also utilized to verify the results. As a result of these observations, it was learned that the temperature in the localized reaction center was 800 to 1000 C°. (1480 to 1800 F°.) higher than the bath temperature [117] (PX-41A and 41B; R.1222-54, 1589-1605, 1760-81).

Thus, conclusive proof of the existence of a localized reaction zone spaced a substantial distance from the refractories has been presented.

Dr. Kemper conducted a series of tests to demonstrate the size and approximate shape of the high temperature reactive zones at J & L's Aliquippa and Cleveland works (PX-452; PX-452A; PX-452B; PX-453; PX-454; PX-454A; R.2489-2512, 2534-39). From his observations, Dr. Kemper concluded that at Aliquippa the area of impingement was approximately 3 percent (R.2550-60; PX-455), and that at the Cleveland operations the indents are basically similar (R.2489-2504).

These tests demonstrate that at its operations in Cleveland and at Aliquippa, J & L produces a localized reaction zone according to the teachings of the patent in suit.

Tests and Demonstrations—Circulation

The claims of the Suess et al. patent speak of "a circulatory movement in the molten metal, which circulatory movement brings those portions of the molten metal bath which are remote from the reaction zone into the reaction zone whereby those portions are subjected to said reaction with minimum injury to the refractory lining." (col. 12, lines 24-29).

Dr. Chipman testified that circulation exists in the bath and that its primary causes is chemical reaction, especially the [118] violent evolution of carbon monoxide (R.553-54, 557-61). Both Mr. Prince and Dr. Elliott testified in a substantially similar manner (R.3479-87; PX-504, pp. 6139-44).

Evidence of the existence of circulation in the bath was presented by the experts. Dr. Chipman testified that purely physically or mechanically induced circulation would cause an upward movement in a bath (R.318-20; PX-137). Dr. Kemper demonstrated this process by blowing nitrogen on a water bath and showed that it is the viscous forces created

by the physical or mechanical action of the jet, and not the downward force of the jet which caused the circulation (PX-239, PX-240; R.2666-83).

The Linz rudder tests [27] were carried out at Linz during May, September and October 1960, July 1963 and additionally in 1966 to demonstrate the direction of circulation in an L-D converter (R.979). The rudders utilized consisted of a steel blade about 8 inches high, 12 inches long and 0.4 inches thick attached to a steel shaft (R.973-74; PX-32-1, p. 12). Through a mechanical [119] system, movement of rudder could be observed (R.944-46, 958, 971-73; PX-32-1, p. 13, Annex 10, PX-165).

The rudders were positioned at various levels in the bath, and the movement of the rudder employed to show the direction of circulation (R.1114-17; PX-167). In all these tests, the rudders in the upper half of the bath indicated a circulation toward the center—no rudder in this region of the bath ever pointed outwardly. On the other hand, the rudders in the lower portions of the bath generally turned outwardly, showing an outward circulation.

Dr. Shapiro studied the data thus collected and stated:

> ". . . I concur with your statement that the only conclusion that holds together from the evidence, from the observations, is that there is established in the steady state a toroidal circulation which is downward in the center, radially outward at the bottom, upward near the walls, and radially inward near the top of the bath." (PX-427, pp. 3865-66).

Dr. Elliott stated, that after examining the rudder test results, he would conclude, ". . . the circulation which developed was downward at the center, out along the bottom, upward along the walls, and back radially inward at the surface . . ." From this he concluded that "The direction of flow is incompatible with circulation caused by mechanical action of the jet." (PX-504, pp. 6265-66).

Mr. Wallner and Mr. Oberhauser drew similar conclusions [120] (PX-167, PX-175; R.1114-17, 1575-89). Mr. Prince verified these conclusions (R.3488-95; PX-334).

Dr. Kemper performed corroboratory tests in vessels in which the direction of circulation was known (R.2589-2610; PX-46, PX-46A). Dr. Kemper interpreted these tests by stating that in the upper 30 percent of the bath all rudders pointed inwardly; in the central region of the bath the flow is primarily downward; and below 80 percent of the bath depth the rudders pointed outwardly (R.2610-14). He summarized his findings as follows:

> "The over-all picture presented by these tests as compared to the tests which we conducted in which we knew the circulation was down in the center, in my opinion, can lead to no other conclusion than in these Linz tests the circulation must have been down in the center, outward along the bottom and inward at the top . . ." (R.2469).

Another test employed to show the down in center circulation was the L-shaped probe test (PX-182A and 182B). In these tests, a test rod was clamped in a triangle-shaped supporting device which could be fastened to the nozzle. After the test piece was inserted in the bath, the oxygen was blown at 8 atmospheres pressure for 20 seconds. The test piece was removed and inspected. On the basis of these tests Mr. Wallner (R.1279) and Dr. Shapiro (PX-427, pp. 3866-70) concluded that the circulation in the [121] bath was down in the center.

Dr. Hauttmann performed three "slab tests" in which steel slabs were positioned near the bottom of the vessel (about 26-28 inches below the bath surface), and the blow-

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[27] The exhibits relevant to the 1960 tests are PX-31B, 32-1, 32-2, 32-3, 32-4, 32-10, 32-82, 32-97A, 33-0, 33-3, 33-4, 33-35, 33-36, 34A, 34B, 35A-3, 51A, 51B, 52A, 164, 165, 167, 168 and 171. Those exhibits relevant to the 1963 tests are PX-161, 171, 172, 173, 179B, 180, 184, 185 and 185A. Those exhibits relevant to the 1966 tests are PX-36A to 36E, 166, 168, 168A, 168B, 168C and 174.

ing was conducted with a .552 inch Laval nozzle at 11 to 13 atmospheres with the lance positioned 24 to 26 inches above the bath (PX-190).

Dr. Hauttmann concluded that the dissolution marks in the center of the slab,

> "... prove that from the reaction field—that is, in the center of the bath surface—a current goes directly downwardly which is capable of causing a depression and a hole, respectively, washed out in the slab; and then, consequently, it turns outwardly towards the walls and goes upwardly along the walls, and then in the surface zone of the metal towards the center." (PX-424, pp. 2220-21).

Dr. Shapiro examined the slab test results and testified:

> "From the way in which the slab was melted by the liquid iron, we can conclude the direction of circulation.
>
> The fact that a hole is formed at the middle of the slab on the axis of the vessel shows that the direction of circulation must have been downward in the center." (PX-427, pp. 3892-93).

That this circulation is caused by chemical reaction is apparent from the alloy-addition tests. These tests were designed to demonstrate the circulation in the bath as caused by chemical reaction and not due to the mechanical or physical action of the oxygen jet. A copper bar was placed in the bottom of the test **[122]** vessel and oxygen was blown (PX-47). In those baths in which the carbon content was high, the rapid evolution of carbon monoxide caused the copper to rapidly go into solution throughout the bath. (R.469-71). However, in the low carbon baths, there was little if any copper in solution in the upper bath regions (R.472-74). From this, Dr. Chipman stated:

> "I come to the conclusion that the evolution of carbon monoxide has a very much greater influence in stirring the bath, in the agitation of the bath, in the mixing of the bath than has the mechanical effect of the oxygen stream." (R.476)

Mr. Wallner testified in a similar manner. (R.1275).

Additional tests were conducted to determine whether adequate phosphorus removal could be obtained by the mechanical action of the oxygen jet, or only as a result of chemically induced circulation. From these tests it was determined that in low carbon baths, the phosphorus content was practically unaffected. However, in the high carbon baths, phosphorus was readily transferred to the slag (R. 478-484; PX-48 and PX-49). This again showed that the chemical reaction caused the circulation.

Dr. Kemper and Dr. Shapiro carried out experiments to demonstrate that the localized reaction zone serves to circulate or stir the bath. To depict this conclusion they carried out a series of tests involving the formation of explosive gas bubbles in a liquid bath. From the movies made of these tests, it could **[123]** be observed that when a vessel has a solid bottom and the enclosed liquid has a free surface, any high pressure bubble formed at the central portion of the vessel, will be driven downwardly to the bottom of the vessel (R. 2911-12; PX-249). The same was found to be true if multiple explosions occurred (R. 2871-75; PX-254).

When an oxyacetylene explosive bubble was employed, an overall circulation was established which was downward in the center (R. 2919-21; PX-256). The same was shown to be true for simultaneously exploded squibs (R.3089-3181; PX-466). From this it would appear that explosive bubbles create a circulation in the bath which is downward in the center.

Dr. Chipman explained that the rapid formation of carbon monoxide is explosive in nature as can be seen from the bath throwout (R. 252, 285-87). He testified that the bubbles which form explosively have an extremely high

potential pressure, and that the FeO is driven below the surface of the bath and reacts with carbon generating bubbles which expand rapidly. The bubbles which are formed below the surface are formed with explosive violence and exert a downward movement in the bath (R. 252, 285-87, 345-359, 360-370; PX-146 and PX-147).

As to the bath throwout, both Dr. Chipman and Dr. Elliott concluded that it was caused by the explosive chemical reaction **[124]** between the carbon and oxygen. (R. 445-74; PX-504, pp. 6268-A-69, PX-160A-160F).

Considerable evidence has been presented here which demonstrates that large quantities of carbon monoxide will evolve from the nucleating sites in the side-walls of the vessel (R. 381-98, 2721-28; PX-148, PX-461, PX-504, pp. 6270-75). These bubbles are low pressure bubbles and tend to rise due to buoyant forces, and to drag liquid along with them. This causes an upward circulation along the side walls (R. 273, 277, 381-88, 407-08, 2738-41; PX-148, PX-427, pp. 3356-59, 3361-3416).

In regard to J & L's operations Dr. Chipman testified (R. 572):

> "Q. And would you tell us also whether in those same operations the chemical reactions produce a circulatory movement in the molten metal?
>
> A. Yes.
>
> Q. And tell us whether or not in those same operations that circulatory movement of the bath brings those portions of the metal bath which are remote from the reaction zone into the reaction zone so that those portions are subjected to the reactions with minimum injury to the lining.
>
> A. Yes."

[125] Dr. Chipman testified that his descriptions of circulation aplied to the J & L converters (R. 252, 257, 263-67, 273, 278-79, 239-40, 288-90). Mr. Price also verified that the

J & L operations were substantially identical to his general descriptions of L-D processes (R. 3272-74).

Thus, it appears that the successful operations of J & L at Aliquippa and Cleveland are to a large extent due to the chemically induced down in the center circulation taught and claimed by the patentees.

In a similar manner, it was shown that in its operations at Aliquippa, J & L utilizes a lance which extends substantially vertically downwardly through the mouth of the vessel striking the central surface of the bath as instructed in the patent in suit.

J & L's Cleveland converters were placed in operation on September 13, 1961 (PX-468, p. 35).[28] While the converters are larger than those at Aliquippa (PX-468, p. 25), defendant has admitted that no significant difference exists between its operations at Aliquippa and its operations at Cleveland **[126]** (PX-484, p. 15). Dr. Chipman and Mr. Prince testified that the operations at the two plants were essentially identical (PX-484, pp. 44-45, 74-77).

Mr. Glasgow of the Cleveland works had been in charge of the Cleveland operation from its inception. He and others visited Aliquippa and studied that operation in detail (PX-468, pp. 20-22). Mr. Edwards of J & L, Aliquippa, participated in planning the Cleveland installation (PX-468, pp. 24-25). Prior to commencement of the operations at Cleveland twelve to eighteen men who were ultimately charged with the operation of the Cleveland works attended training sessions at Aliquippa (PX-468, pp. 32-33).

In addition, Mr. Glasgow and others visited a number of L-D operations prior to commencement of operations at Cleveland. (PX-468, pp. 38-42). Mr. Glasgow also testified

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[28] Relevant information concerning the Cleveland converters appears in PX-72 to PX-77, PX-331A to PX-331H, PX-126 to PX-133, PX-361, PX-363, PX-364, PX-366, PX-383, PX-386, PX-378 to PX-381, PX-468; R. 3394-3449).

that he had observed a number of plants after the Cleveland start-up and all were similar in operation to Cleveland (PX-468, pp. 43-49).

While I have carefully detailed the technological testimony presented by the plaintiffs' expert witnesses as the scientific circumstances surrounding the J & L mills, both at Aliquippa and at Cleveland, and as this testimony corroborates the fact that J & L had adopted and is using the Suess process in both its mills, I mention the fact that the defendant, except for its Charleston, South Carolina tests and Exhibits DX-212 and DX-213, produced very little evidence as scientific data on the behavior character of the reaction of oxygen and oxidizable impurities in the bath. The defendant contended that the movement in the bath was one of disorder rather than one of pattern as contended by the plaintiffs. However, the defendant offered this only as its conclusion without any credible evidence to support it. The burden was on the plaintiffs to show in these cases that the defendant at its Aliquippa and Cleveland mills adopted and was using the Suess et al. process, and this it did by its considerable scientific evidence by experts and demonstrations. The burden then shifted to the defendant to contradict the plaintiffs' evidence. By its virtually complete failure to offer similar scientific evidence, I am provided with sufficient authority to find that the defendant had no such proof, and that therefore, this considerable evidence by the plaintiffs was credible to support a finding that the defendant was making and using the Suess et al. process in violation of its agreement with the plaintiffs for the Aliquippa mill and as an infringement of the Suess et al. patent at the Cleveland mill.

[127] **Conclusion and Determination**

Accordingly, the determinations as to operations at Aliquippa are likewise applicable to operations at Cleveland,

and from all of the evidence, I conclude that J & L's operations at Aliquippa and Cleveland infringe on the claims of the Suess et al. patent.

The final determination to be made is that of damages. In the contract action the damages are readily ascertainable and an appropriate order will be entered. In the infringement action the issue of damages has not yet been tried and therefore an appropriate order will be entered assigning this matter to a United States Magistrate as a special master pursuant to Rule 53 of the Federal Rules of Civil Procedure and the Order of the United States District Court for the Western District of Pennsylvania Adopting Rules for United States Magistrates.

While this Opinion incorporates findings of fact and conclusions of law, as required by Rule 52 of the Federal Rules of Civil Procedures, pursuant to Rule 52(b) of the Federal Rules of Civil Procedure, the parties may submit further proposed findings of fact and conclusions of law, and shall also submit a proposed Order of Court, consistent with this Opinion.

January 29, 1974

[For the convenience of the Court, minor typographical errors in the foregoing opinion of the District Court have been corrected where no change in substance results on the assumption that such corrections would be made upon publication of the opinion in the Federal Reports.]

JUDGMENT OF THE DISTRICT COURT

[Entered February 19, 1974]

AND NOW, TO-WIT, this 19th day of February 1974, these consolidated actions having been heard before me on the pleadings, and on proofs, briefs and arguments submitted by the parties, and after the court rendered its opinion consisting of the Opinion Compendium—Collateral Estoppel, Opinion Summary—Collateral Estoppel and the Opinion—The Jones and Laughlin Cases, and for the reasons stated therein, IT IS HEREBY ORDERED, ADJUDGED AND DECREED as follows:

1. The aforesaid Opinion Compendium—Collateral Estoppel, Opinion Summary—Collateral Estoppel, and the Opinion—The Jones and Laughlin Cases, constitute this court's findings of fact and conclusions of law pursuant to Rule 52(a) of the Federal Rules of Civil Procedure.

2. The Plea of Estoppel raised by the defendant, Jones and Laughlin, in these consolidated actions both as to the file wrapper and collateral estoppel is denied.

3. The United States Letters Patent No. 2,800,631 are valid and enforceable.

4. The License Agreement dated February 4th, 1956 between the plaintiff, Kaiser Industries Corporation (formerly Kaiser Engineers), and the defendant, Jones & Laughlin Steel Corporation, is valid and enforceable, and the defendant has breached the said agreement and is liable for damages for such breach of agreement.

5. The defendant has infringed and is infringing at its Cleveland, Ohio steel mill the claims of United States Letters Patent No. 2,800,631 and is liable for damages for such infringement of said patent.

6. Reference is hereby made to The Honorable Robert C. Mitchell, a United States Magistrate for the United States District Court for the Western District of Pennsylvania, who is hereby constituted as a Special Master pursuant to Rule 53 of the Federal Rules of Civil Procedure and the Act of October 17, 1968, 28 U.S.C. § 636 (b)(1), as amended, and Local United States Magistrates Rule 1C(1) of the United States District Court for the Western District of Pennsylvania, to conduct appropriate proceedings consistent with the aforesaid findings of fact and conclusions of law and this Order of Court, for the inquiring into and determining damages which may be due and owing by the defendant to the plaintiffs, or any of them, for the breach of agreement entered into between the plaintiff, Kaiser, with the defendant, J & L; and further to inquire into and determine damages which may have accrued by reason of infringement by the defendant of United States Letters Patent No. 2,800,631. Such proceedings by the special master shall be conducted in accordance with specific instructions, separately filed, and in accordance with law.

7. The defendant's counterclaims are hereby dismissed.

8. The plaintiffs shall recover from the defendant their costs in these actions to be taxed by the Clerk of Court pursuant to Federal Rule of Civil Procedure 54(d).

9. This court retains jurisdiction for the entering of such further orders as may be necessary and appropriate in these proceedings.

/s/ LOUIS ROSENBERG
United States District Judge

ORDER OF THE DISTRICT COURT INSTRUCTING THE SPECIAL MASTER

[Entered February 19, 1974]

And Now, To-Wit, this 19th day of February 1974, the following shall be specific instructions to the Special Master in the above entitled cases for the purpose of making determinations of damages pursuant to the Order of Court dated this 19th day of February 1974:

1. The Special Master shall be guided by these instructions and by Federal Rule of Civil Procedure 53.

2. The primary questions before the Special Master is, what fair compensation the plaintiffs, or any of them, may be entitled to as damages (1) because of a breach of license agreement dated February 4, 1956 between Kaiser Industries Corporation (formerly Kaiser Engineers) and Jones and Laughlin Steel Corporation; and (2) because of infringement by the defendant at its Cleveland, Ohio steel mill of United States Patent Letters No. 2,800,631, and as such is owned or licensed by the plaintiffs, or any of them.

3. Subject to the limitations stated in the Order of Court dated the 19th day of February 1974, the Special Master shall exercise the power to regulate all proceedings in every hearing before him and to do all acts and take all measures necessary or proper for the efficient performance of his duties under the Order. He shall require the production before him of evidence upon all matters embraced in the reference including the production of all books, papers, vouchers, documents and writings applicable thereto. He shall rule upon the admissibility of evidence unless otherwise directed by order of reference and shall have authority to put witnesses and parties to the actions on oath and may himself examine them. When a party so requests, the master shall make a record of the evidence offered and excluded in the same manner and

subject to the same limitations as provided in Rule 43(c) of the Federal Rules of Civil Procedure for a court sittings without a jury.

4. Compensation for damages shall mean the full and perfect equivalent in money of the losses suffered by the plaintiffs, or any of them, as prescribed in these instructions.

5. While the Special Master will be required to determine what the fair or just compensation in damages are here, such a determination cannot be arbitrary.

6. Such damages must be based upon factual findings from the evidence and arrived at fairly in accordance with the law prescribing the limitations for damages under these specific instructions.

7. The determination is to be made in the light of all the facts as divulged by the evidence and as such facts are governed by law.

8. The evidence shall at all times be legal evidence as the same has been adjudicated in the courts of law for the admission of evidence at the trial of any case, and with which a person learned in the law shall either be familiar or have available ready judicial authority on the matter.

9. The Special Master shall be the judge of the credibility of the witnesses and shall arrive at the credibility by the manner in which a witness gives his testimony, his demeanor upon the stand, the reasonableness or the unreasonableness of his testimony, his means of knowledge as to any fact about which he testifies, his interest in the case, the feeling he may have for or against any of the parties, or any circumstances tending to shed light upon the truth or falsity of such testimony.

10. The Special Master shall say what weight is to be given to the testimony of each and all the witnesses.

11. As for the expert testimony, if any should be presented, the Special Master shall evaluate the evidence of such expertise in accordance with legal principles as these define the qualifications of an expert in a particular field. Ordinarily the laws of evidence do not permit a witness to testify as to his opinions or conclusions, but an exception exists in the case of an expert witness. These are persons who have become experts in any art, science or profession and they may state their opinions as to a matter in which they are expert upon the limited evidence submitted to them and which is material to the case. They may also state the reasons for such opinions. However, the Special Master may give such weight as he deems appropriate to the evidence and opinion of any expert, or he may disregard the testimony of any such expert, if such is warranted. The Special Master shall be prepared in the first instance to rule upon whether or not a so-called expert is qualified to testify and present his opinion in this matter.

12. The fact that a person is an employee of either of the parties and yet may be expert in a particular relevant field, does not disqualify that person by reason of his employment but such may be taken into consideration by the Special Master in arriving at the weight the evidence of such a witness deserves.

13. The Special Master must perform his duty without bias or prejudice and must carefully and impartially consider all of the evidence and follow the law, whether here stated or not, in order to arrive at a just award of damages.

14. As relates to the question of compensatory damages for breach of contract, the Special Master will be guided by an interpretation of the License Agreement dated February 4th, 1956, as entered into between the plaintiff, Kaiser Industries Corporation (formerly Kaiser Engineers) and Jones and Laughlin Steel Corporation,

the defendant, with special note that the agreement provides (PX7-A, page 8): "This agreement shall be interpreted and enforced, and all questions and controversies arising hereunder, shall be resolved and adjudicated in accordance with the laws of the State of New York". The Special Master will inquire, also, into the rate of interest and periods during which the same applies and make findings accordingly.

15. The Special Master will remember that the measure of damages applicable in a breach of contract case is that the aggrieved party should be placed as nearly as possible in the same situation he would have occupied had there been no breach. Thus, the measure of compensatory damages is such sum as will compensate the injured party for the loss sustained, with the least burden to the one charged with the breach thereof, consistent with the idea of fair compensation.

16. As for any compensatory damages which may be allowed by reason of the defendant's infringement, the law provides that the plaintiff is to be fairly compensated for all damages, if any, proximately caused by the defendant's infringement.

17. The actual damages to the plaintiff caused by infringement are ordinarily most accurately determined on the basis of what from a preponderance of the evidence in the case would have been a reasonable royalty to be paid for a license to use the invention during the period of the infringement.

18. A reasonable royalty is the amount which the owner of a patent would accept, who is desirous of licensing another to use his patent in return for a royalty but who is not forced by financial need or other compulsion to do so, and the amount which a person would be willing to pay as royalty, who is desirous of obtaining a license to use the invention but who is not compelled to

do so. In other words, a reasonable royalty is the amount which free and uncompelled and uncoerced bargainers would agree upon.

19. In determining a reasonable royalty, the Special Master shall consider any evidence in the case as to the profits the defendant may have realized from the infringement, as well as any evidence in the case as to what the plaintiff may have lost because of the infringement, also any opinions in the evidence as to what would have been a reasonable royalty during the period of infringement.

20. The law permits the owner of a patent to give his opinion as to a reasonable royalty; and the testimony of a patent owner as to a reasonable royalty is to be weighted and considered the same as that of any other witness expressing an opinion as to a reasonable royalty, but if the reasons given in support of the patent-owner's opinion as to a reasonable royalty are unsound, the opinion may be rejected or given any weight it deserves.

21. In determining the issue as to damages, it must be borne in mind that the law does not permit the award of any greater sum than the monetary loss which the plaintiffs have suffered or may suffer as a proximate result of the defendant's infringement, without regard to whether the defendant has gained or lost by the infringement.

22. The question, then, in determining the issue as to damages is: What monetary loss, if any, did the owner of the patent suffer by the infringement? The answer can ordinarily be found by taking the difference between the plaintiff's financial condition after the infringement, and what his financial condition would have been if the infringement had not occurred, all as shown by a preponderance of the evidence in the case.

23. Additionally, the patent statute, 35 U.S.C. §§ 281-284 dealing with damages for infringement, must be referred to for such additional guides as may be required of the Special Master, who is a United States Magistrate and one learned in the law.

24. The damages are not to be deemed conjectural or speculative merely because they are incapable of calculation with mathematical exactness. The law requires that a reasonable quantity of information must be supplied by the one alleging damages so that fairly estimated amount of damages may be ascertained from the evidence.

/s/ Louis Rosenberg
United States District Judge